PMM

Precision Metal Molding

INCLUDING DIE CASTINGS MAGAZINE

FEBRUARY
1956

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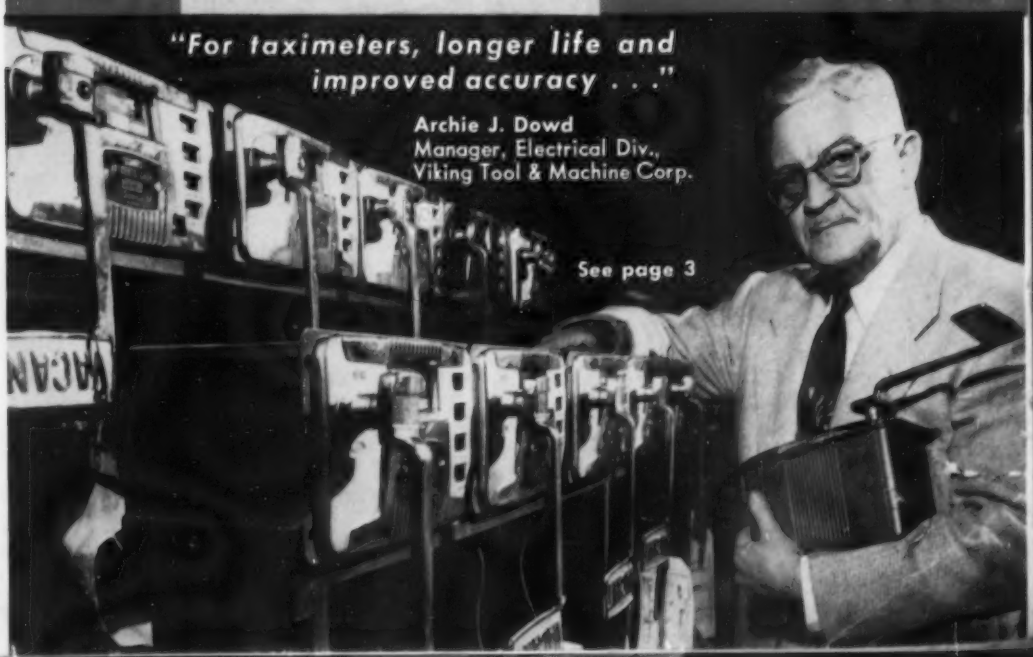

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See page 3

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The new Cast-Master Model-M for die casting magnesium, brings to the industry a safer, faster, more economical method for producing magnesium castings than ever before. The machine embodies the same fine features of other Cast-Master die casting machines. The "Dow type" hot end for die casting magnesium is used for metal injection. This end is similar to a zinc hot chamber arrangement thereby eliminating the disadvantage of hand ladling and making high speed production possible.

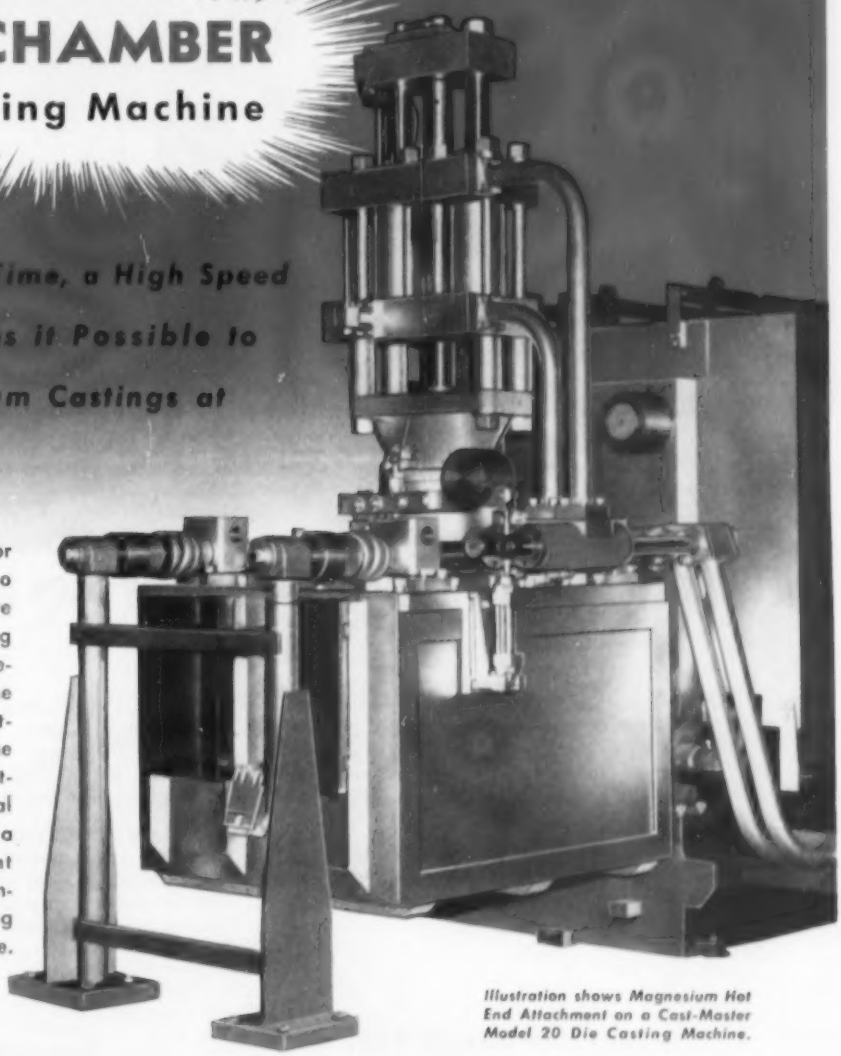
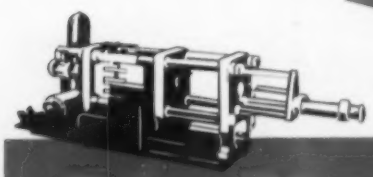


Illustration shows Magnesium Hot End Attachment on a Cast-Master Model 20 Die Casting Machine.



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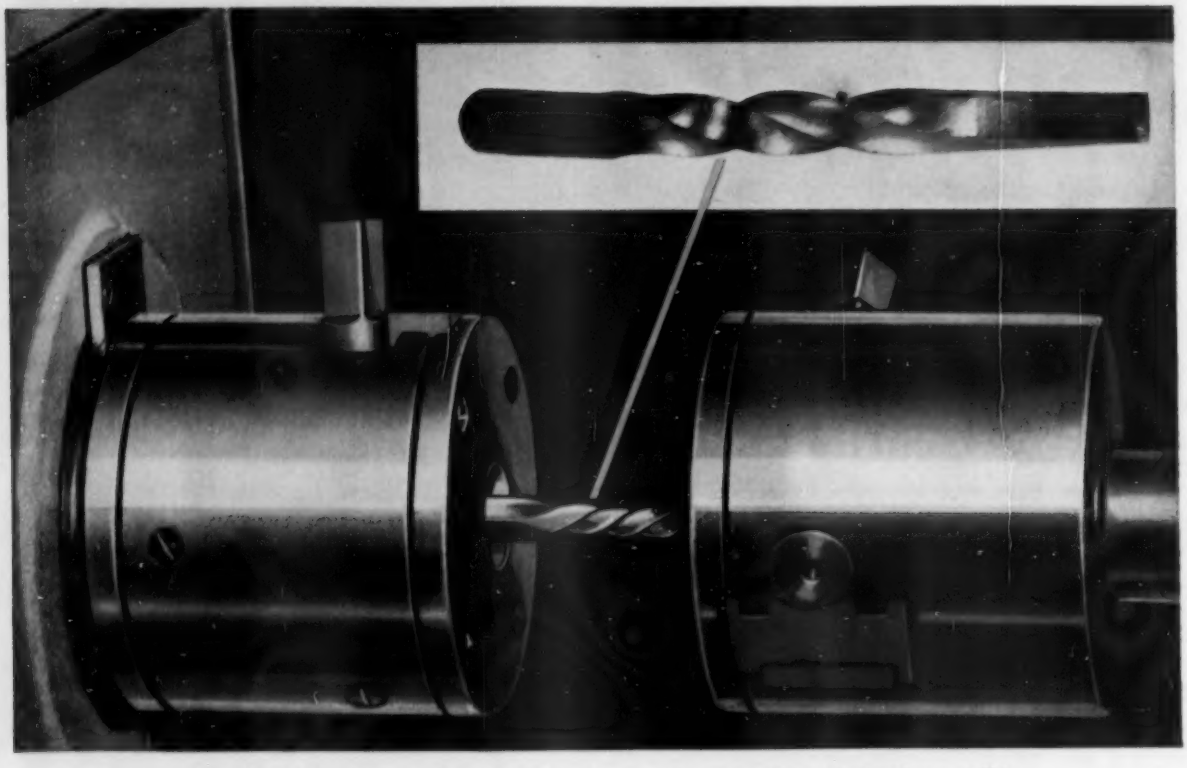

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COVER STORY

TEST RACK: Every Viking Taximeter is test run 2,000 miles at 120 mph and 25% overvoltage, then 700 miles at regular conditions. Archie J. Dowd, Manager, is shown at the test rack where these meters, built of die castings and investment castings, are being checked. For the story, see Page 48.

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FEBRUARY 1956 VOLUME 14 NUMBER 2

Precision Metal Molding

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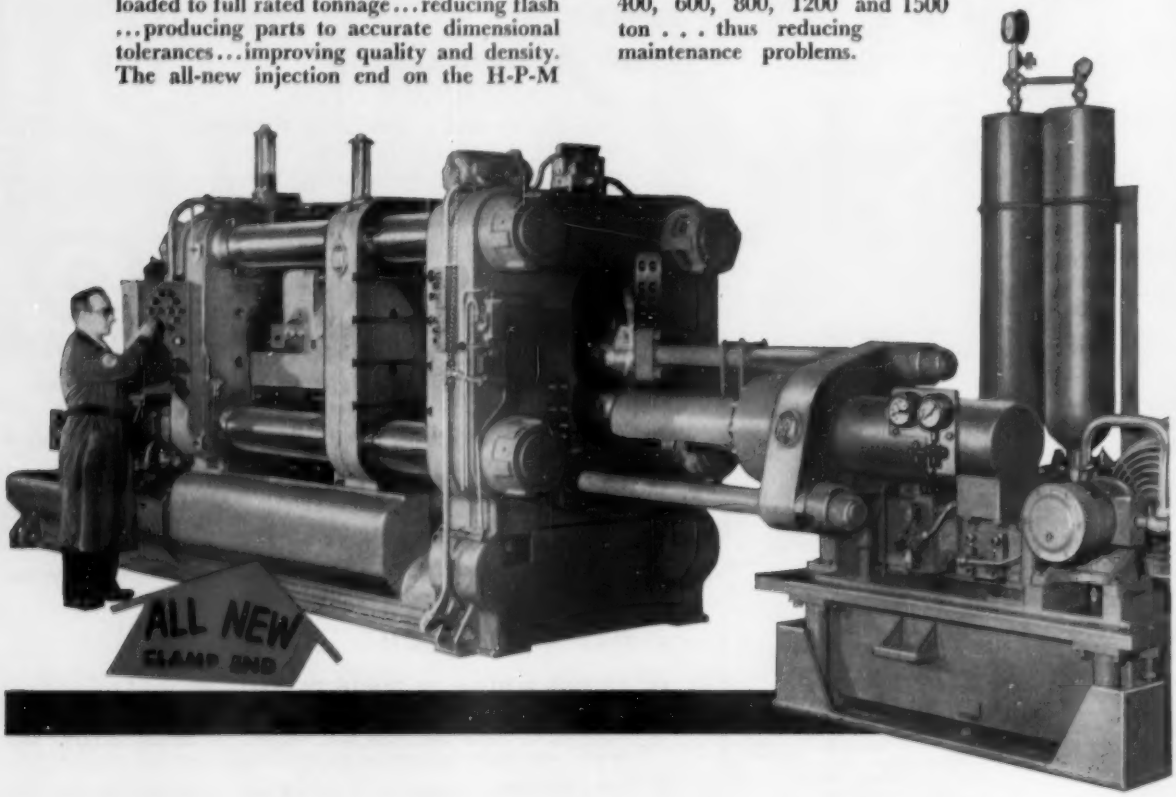

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We Believe They Do!

- Positive, self-compensating lock to the rated tonnage or better . . . high mechanical advantage from flat-faced wedges and knuckle joint links.
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ALL NEW
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- A completely self-contained unit . . . not dependent on clamp end for operation.
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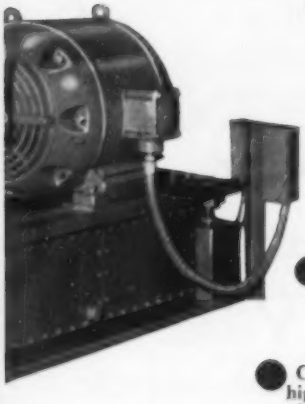
- Injection speeds up to 1,000 feet per minute with ASME coded 2500 lb. accumulators.
- Complete control, through special valves, for any distance—speed curve.
- Complete manifolding of all high-pressure hydraulics . . . no swivel joints or hose.
- Flexible injection stroke for control of metal volume and cover die thickness.



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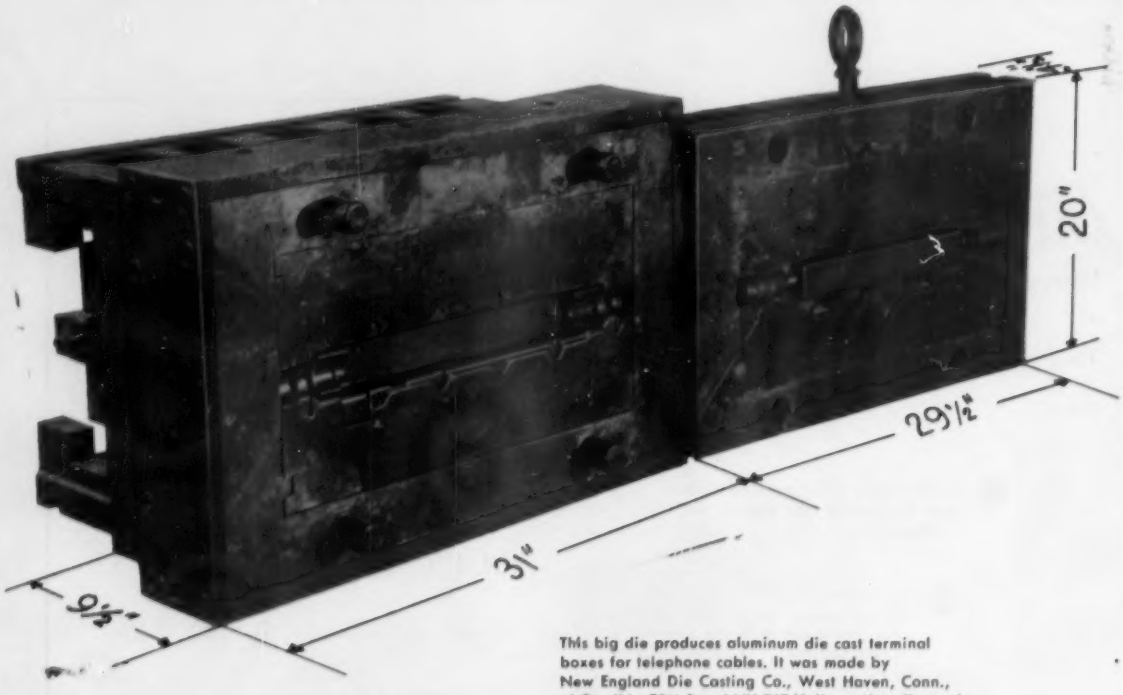
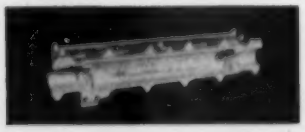


This big die produces aluminum die cast terminal boxes for telephone cables. It was made by New England Die Casting Co., West Haven, Conn., of Crucible CSM 2 and NU DIE V die casting die steels.

it's made of

ultrasonically inspected



CSM 2 and NU DIE V

...from Crucible warehouse stock

The die above, built by New England Die Casting Company, West Haven, Connecticut, casts aluminum electrical terminal boxes. The holder block is prehardened CSM 2 – the insert NU DIE V – both promptly obtained from local Crucible warehouse stocks.

Crucible CSM 2 and NU DIE V are made for and inspected to die casting steel quality. They're an unbeatable combination – perfect for holder blocks, solid dies, inserts or sleeves – for any die casting application.

What's more, delivery is from local warehouse stock – in 438 sizes – 1" to 40" wide . . . ¾" to 15" thick – all ultrasonically inspected. You just can't beat Crucible die steels for quality or availability. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

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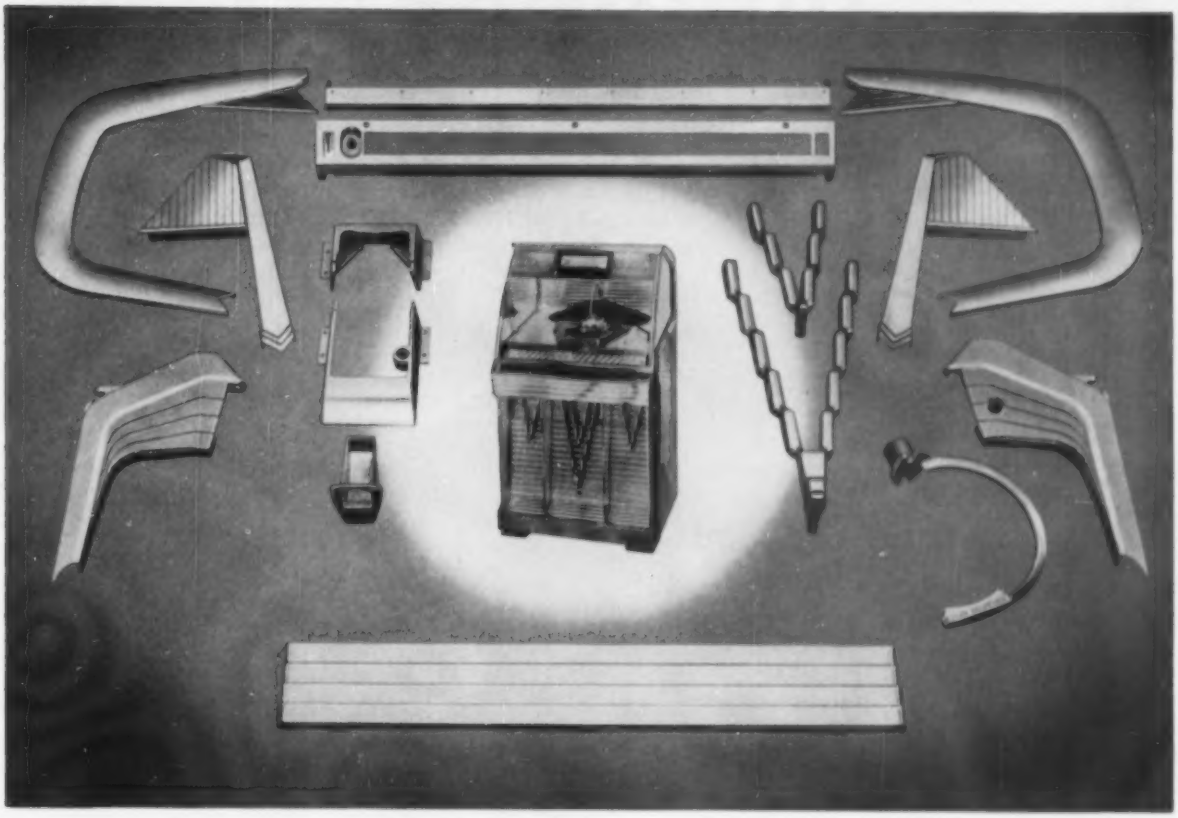

ease of assembly for ROCK-OLA

Much of the cost and many of the headaches involved in turning out a product like a coin operated phonograph are centered on the assembly line. Rock-Ola engineers, like those in many other fields of product engineering, minimize their assembly problems through the well-planned use of ZINC Die Castings.

The castings shown here comprise most of the exterior trim on the latest Rock-Ola Hi-Fidelity music maker. Because the unusual shapes can be die cast, the eye-catching decorative effects—highly important to the success of this product—are achieved with an absolute minimum number of components.

Since all ZINC Die Castings in a long production run are identical in size (with precisely located fastening elements) assembly is rapid and trouble-free. Furthermore, the smooth, as-cast surfaces of ZINC Die Castings require no special preparation prior to the application of beautiful, durable chromium plate by standard finishing procedures.

Other important reasons for the ever-growing popularity of ZINC Die Castings will be covered in this space in the months ahead. Send for a copy of our brochure and contact any commercial die caster for the answers to your particular production problems.

The New Jersey Zinc Company, 160 Front Street, New York 38, N. Y.

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FOR DIE CASTING ALLOYS

The Research was done, the Alloys were developed, and most Die Castings are based on

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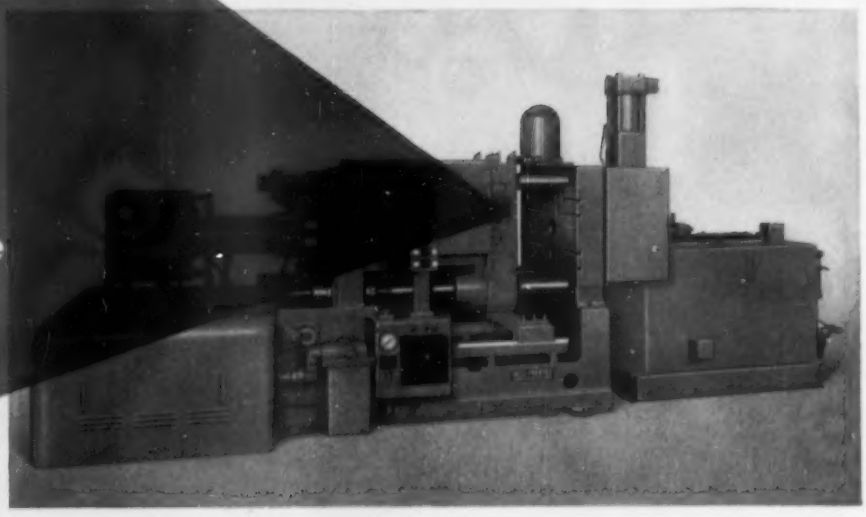

with REED-PRENTICE Positive Mechanical Locking Action

Exclusive REED-PRENTICE *positive*, mechanical die locking eliminates all "pressure back-off"... produces uniform, porosity-free, "Hardware Finish" zinc castings. Costly finishing operations are cut to a minimum, giving lower unit costs, higher production.

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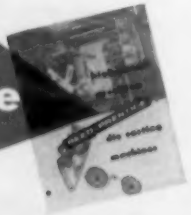

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BETWEEN THE LINES

STAINLESS STEEL IS TO INVESTMENT CASTING what zinc is to the die casting industry, according to E. L. White, Jr., writing in this issue of PMM. He explains his viewpoint and documents it with a tabulation of composition and properties of stainless steel alloys that are commonly being investment cast today. No one can argue with the prominent place of stainless steel in the repertoire of the investment caster today, and there is a great deal of practical value in Mr. White's charts. Story begins on page 42.

SPEAKING OF ZINC in this issue is a man who has been active in the leadership of ASTM and other industry groups in connection with the die casting alloys. When ASTM organized its Subcommittee XV of Committee B-2 (since called B-6 Committee) back in 1926, Don Colwell served as first chairman of the subcommittee on zinc alloys. He has been continuously, as a metallurgist in the die casting and alloy industries, an active member of ASTM and SAE committees since that time. Now, with serious consideration being given to a reduction in number of die casting alloy specifications, Mr. Colwell has outlined for PMM the history and present status of these alloys. Zinc is covered in this issue on page 44, aluminum in March.

HOW TO COMBINE ALUMINUM WITH STEEL is the subject of a feature article in the March issue of PMM, describing a method that is being used successfully to bond steel to die castings, permanent mold castings and investment castings. The wearing properties and strength of steel are thus combined permanently with the lightness, heat transfer or other properties of aluminum, to create new engineering materials.

TWO-TONE GOLD AND SILVER finish on the large die cast bezel for Zenith TV sets this year is a keynote of the styling. The step-by-step photo story of the application of this Roman gold and matte silver finish is presented in this issue beginning on page 67.

CHECKING SAMPLES of new castings is a critical stage in the procurement of castings. If you buy investment castings, in this issue you'll find answers to such questions as: Should the buyer approve the dimensional accuracy of the vendor's tools? When should sample castings be submitted and what should be checked? Are second samples necessary? What check should the buyer make on dimensions, physical properties, metallurgy? See page 55.

how to substitute aluminum *for copper in electrical manufacturing*

Due to the high cost of copper, repeated attempts have been made to substitute aluminum for this costly metal for electrical purposes. While it is true that more aluminum than copper is required to transmit a given electrical impulse —the lower cost of aluminum makes the substitution very attractive from a cost standpoint. Unfortunately, on all previous attempts to use aluminum for electrical conductivity the aluminum corroded, causing poor contacts and subsequent failure of the mechanisms involved.

And that's where KENVERT 40 comes in—*a chrome sealer especially designed to prevent the oxidation of aluminum* by sealing it with a film having a very low microhm resistance.

Write for complete details or send us specification data concerning your problem. We will be glad to advise you.

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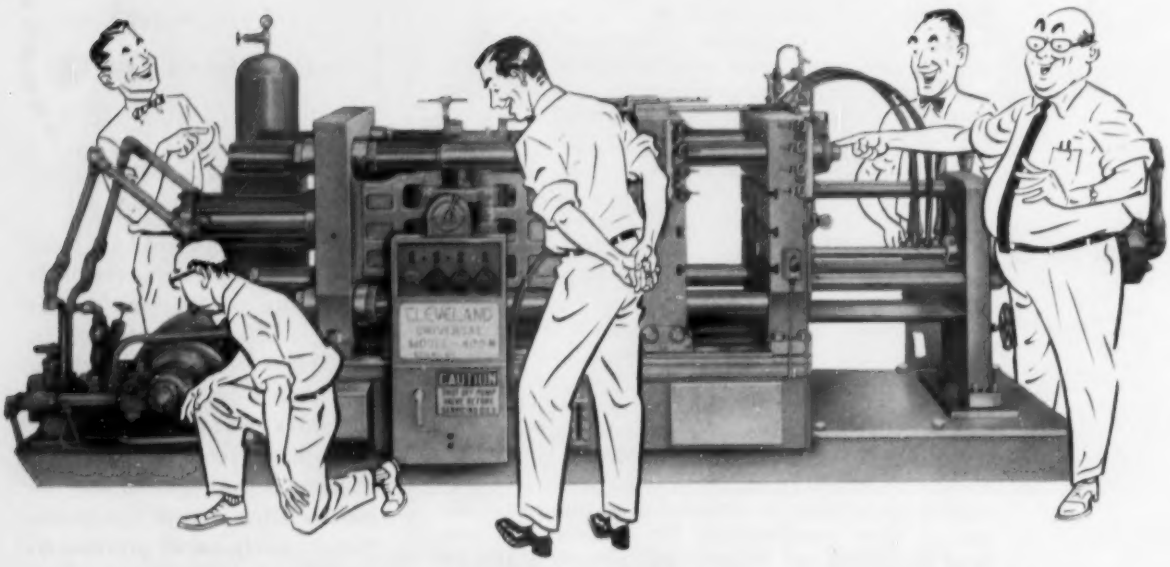
WELL WORTH LOOKING INTO!

Cleveland Model 400-N shown with cold chamber end. Weight of metal per shot, including gate: 7.2 lbs., aluminum; 14.5 lbs., zinc.



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From every angle, the new Cleveland Model 400-N has every feature you're looking for to give you better castings, faster, at less cost!

Here is a massively constructed, rugged, powerful machine. It locks dies at better than 400 tons pressure, *strain gauge tested.* Its faster die closing and opening speed will give you more shots per hour. Its rapid injection speed guarantees production of sound, dense, hardware-finish castings. Further, Cleveland's time-tested design and quality construction assure dependable, around-the-clock operation with machine maintenance at a minimum level.

Look into the new Cleveland Model 400-N, from every angle. You'll quickly discover why leading die casters call it the outstanding machine buy in its capacity range. Call in a Cleveland sales engineer for complete information and send for the new Model 400-N Bulletin.

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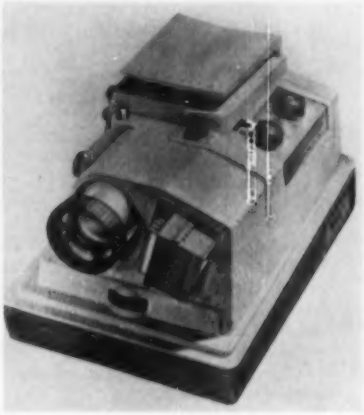
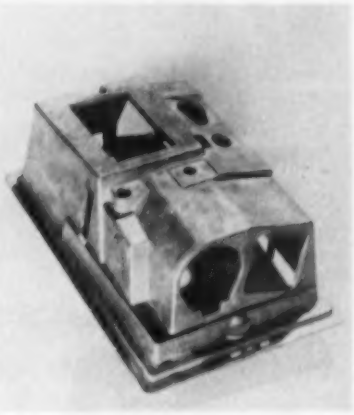
CASTING ABOUT

WITH BANKS GIVING PREMIUMS to entice new depositors, it is not surprising that an investment caster has come up with what is believed to be the first "Tool Charge Rebate Plan" to be offered by a jobbing foundry. In commemoration of its tenth anniversary, Engineered Precision Casting Company of Matawan, N. J., has announced this unique rebate system, effective from Nov. 1, 1955 through Oct. 31, 1956. Details of the plan include the offering of a 15 percent reduction or refund on the tooling charge of the first part for which an order is placed during the anniversary period. Maximum allowance; $50. The same refund is also offered on every tenth part ordered thereafter.

FASHION NOTES: the two-tone color treatment that Kiekhaefer Corp. has given its new line of Mercury outboard motors has been given the Fashion Academy Gold Medal for 1956. The trim die cast designs, given sparkle with the colorful combinations such as Sunset Orange and Desert Sand, Sarasota Blue and Desert Sand, Marlin and Gulf Blue, etc., are credited by the Fashion Academy with having ". . . revolutionized the entire boating industry and made it fashion conscious . . ."





LOOK, MA, NO HANDS! That's one feature camera fans will like about this new 35 mm slide projector put on the market by Revere Camera Co. The new projector, made practical by means of a handsomely styled die cast housing, shows up to 36 slides automatically at a predetermined pace, and requires no operator. The one-piece, thin-walled, intricately shaped aluminum housing, produced by a Chicago area job-shop die caster, is the most impressive of the six lightweight die cast pieces of which the projector is constructed. The die is precisely cored for the lens cavity, operating control knobs, slide magazine and elevation and level control knobs. Because die casting permits the use of very thin walls (thickened where needed for mounting or stiffening) Revere has been able to hold the weight down. Also die cast are the L-shaped hood, two lens housing components, and twin honeycomb grilles. Finish is an attractive "wrinkle" paint.

Photos: American Die Casting Institute

Continued on page 12

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give up to
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Your Engineer is Right!

Investment Casting permits new approaches to design and production engineering, unbound by the restrictions of traditional metallurgical practices and manufacturing techniques.

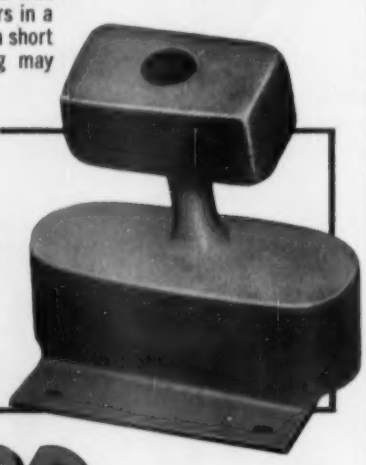
Major economies are obtained when your products or components are designed . . . or redesigned . . . with tolerance, surface and inspection criteria to conform with casting techniques. The resultant savings in final cost and production time, more than repay this small investment.

Your design engineer deserves and requires the great flexibility and latitude in design and production planning offered by Investment Casting. If application requirements demand that a part be of complex shape, intricate contours in a material that's difficult to form or machine, in short or long run quantities, Investment Casting may provide the economical answer.

CASE IN POINT!

Freedom of Design

The rudder over-balance eliminator used on the jet bomber is an investment casting of specification QQ-M-55 Magnesium, Alloy AZ-92. This intricate design is more economically produced by investment casting than any other process, permitting design freedom and assuring quality performance.



ARWOOD

ARWOOD PRECISION CASTING CORPORATION

71 Washington Street • Brooklyn 1, New York

Plants: Brooklyn, N. Y. • Groton, Conn. • Tilton, N. H. • Los Angeles, Calif.

"PIONEERS IN INVESTMENT CASTING"

For more information circle No. 9 on the Reader Service Card

CASTING ABOUT
continued from page 11

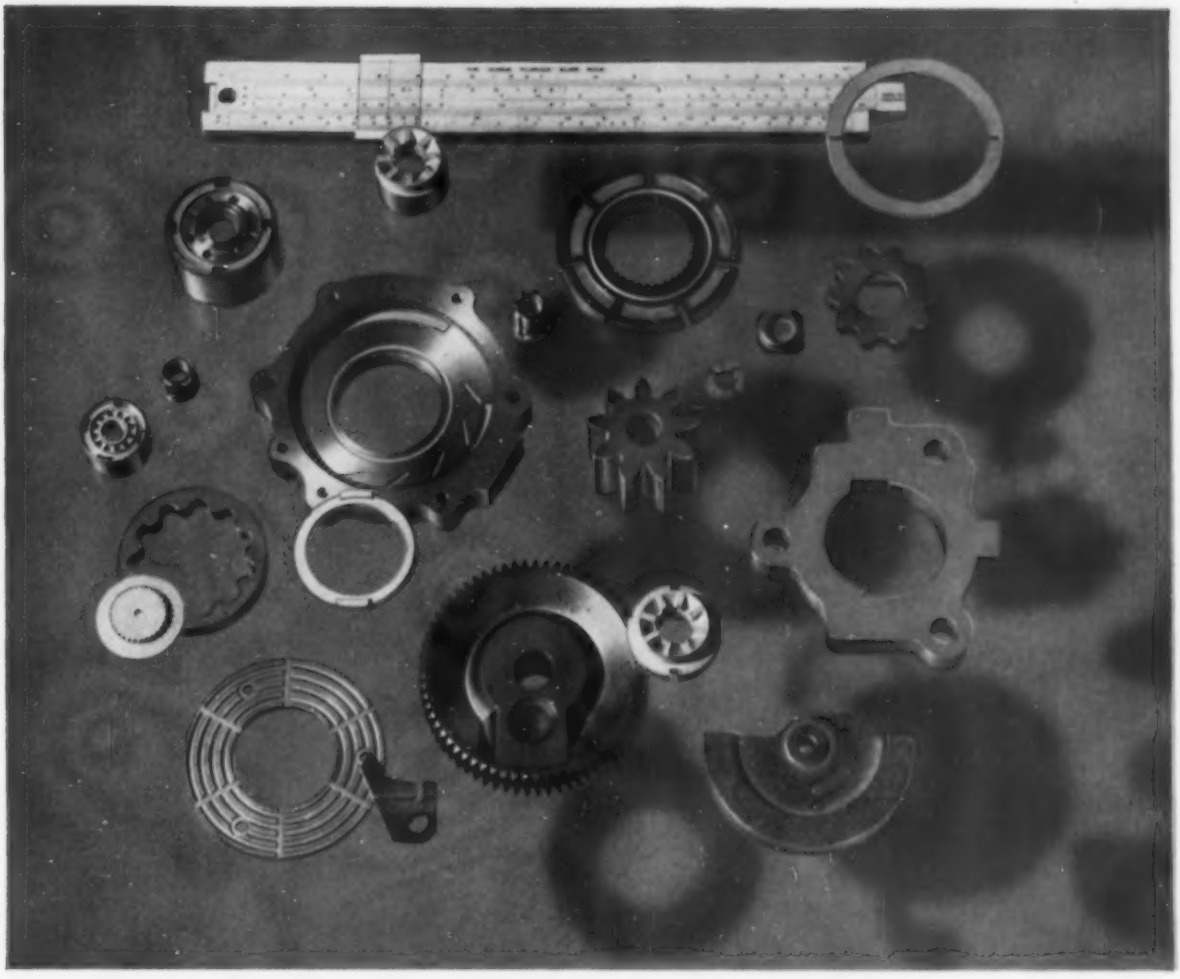
UP TO 2,500 POUNDS OF CASTINGS can be cleaned in this new double-unit, sand-blast cleaning machine installed at Empire Steel Castings, Inc., Reading, Pa. Although installed primarily for

fine cleaning of stainless steel castings, it will also be used for large alloy and carbon castings.

DESIGN ENGINEERING PROBLEMS will be the primary topic for discussion at a conference announced by the machine design division of the American Society of Mechanical Engineers. The session, to be held at Convention Hall in Philadelphia May 14-17 concurrently with the First Design Engineering Show, will spend the first day wrestling with the subject, "Cost Reduction in Product Design." The second day's panel discussion will deal with the problems of finding suitable men for the design engineering field, while the third day will be devoted to selection of engineering materials.

INVESTMENT CAST IMPELLERS in stainless steel are reported by a prominent pump manufacturer to have resisted corrosive attack from three to five times longer than sand cast impellers subjected to identical service. According to Eric Anderson, chemical engineer for Eco Engineering Co. of Newark, N. J., type 20 stainless steel impellers that are investment cast have extended service life because of the smoother surfaces of these castings. A substantial cut in friction loss for faster and smoother fluid flow is also noted.

FIRST NEW ENTRY into primary aluminum production since 1946 was Anaconda Aluminum Company, which formally opened a $65 million dollar producing plant at Columbia Falls, Mont. late in 1955.



A look at your needs . . . through the eyes of our experiences

You are looking at a typical group of precision parts each of which is being produced in large quantities by Moraine Products from metal powder. When you note the wide variation in shapes and sizes, you will realize each part was designed for a specific application.

What may not be obvious is the fact that, when Moraine Products is asked to produce parts like these, each part is carefully weighed in these terms: What will it be asked to do for the end product of which it will become a component?

Because we purchase or manufacture—for our own use, in our own plant—parts made by stamping, screw machine, forging, cold-heading, molding, and casting, we are familiar with a wide range of processes commonly used in industry. Consequently, our judgment can be considered realistic when we recommend metal powder and powder metallurgy as the material and the process best suited for a specific part.

Other Moraine products include: Moraine power brakes — Delco hydraulic brake fluids, brake assemblies, master cylinders, wheel cylinders and parts—Moraine friction materials —porous metal parts—rolled bronze and bi-metal bushings—self-lubricating bearings, and automotive engine bearings.

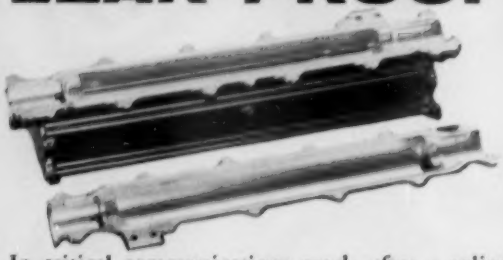
Another General Motors Value

Moraine Products

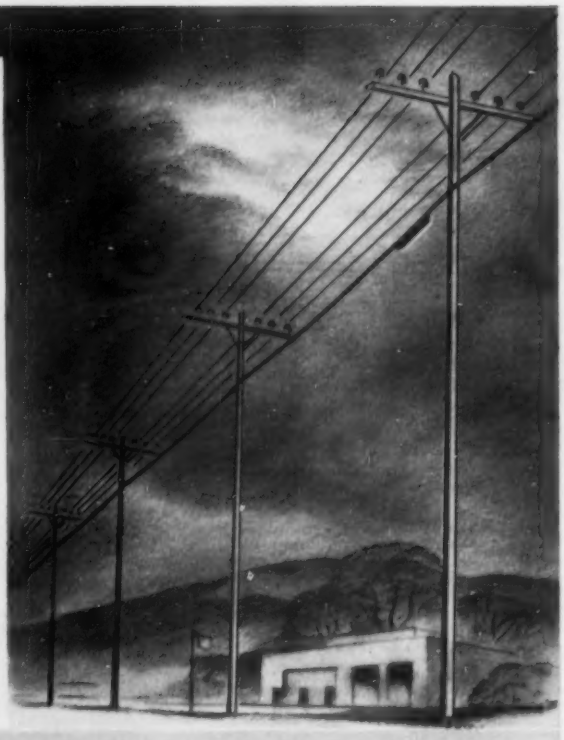
Division of General Motors, Dayton, Ohio

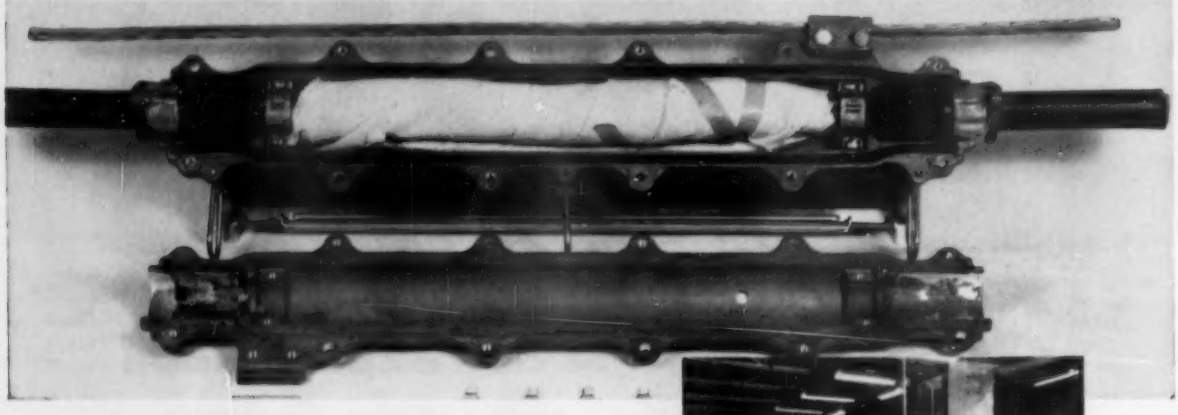
these die castings had to be

LEAK-PROOF



In critical communications work, after a splice has been made on a telephone aerial distribution cable, the splice must be protected against moisture. To accomplish this, Western Electric Company is producing a die cast aluminum splice case, basically cylindrical, the two halves of which are bolted together with suitable gasketing material. The housing thus forms a weather-tight seal capable of withstanding internal gas pressure of 10 P. S. I.





These parts are run at New England Die Casting Company. Many other parts, meeting the same exacting requirements of the most critical industrial applications, are run in the all-Lester-shop.

Mr. Charles W. Ohse, President of New England Die Casting, knows that he can offer his customers the best in die castings because he has the best in die casting machines—Lesters.

If you want additional information about Lester machines just drop us a line. And ask to receive the Lester-Phoenix house organ, "The Lester Press."

LESTER DIE CASTING MACHINES

REPRESENTATIVES

New York . . . . Steven F. Krould
Detroit . . . . . M. R. Tenenbaum
Chicago . . . . . J. J. Schmidt
Cleveland . . . . . Don Williams
Coral Gables . Morton Machinery Sales
Cincinnati . . . Index Machinery Corp.
Los Angeles . . . . Machinery Sales Co.
St. Louis, Milwaukee . . . . A. B. Geers

FOREIGN

Toronto, Canada . A. R. Williams Mach. Co., Ltd.
Sydney, Australia . . . Scott & Holladay, Ltd.
Japan . . . . Okura & Co., New York, Inc.
Stockholm, Sweden . . Aktiebolaget Servus
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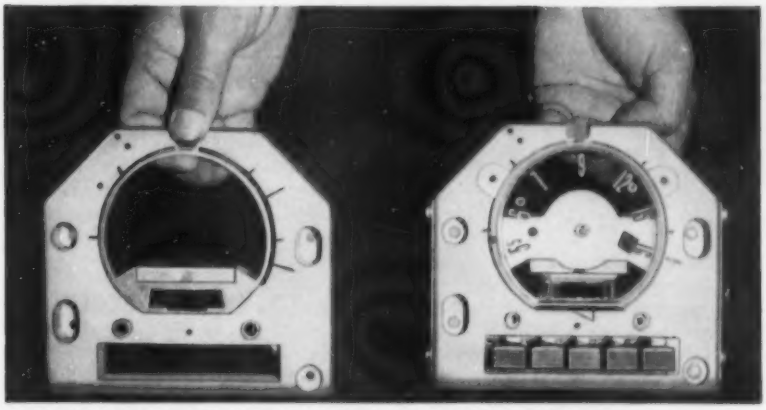
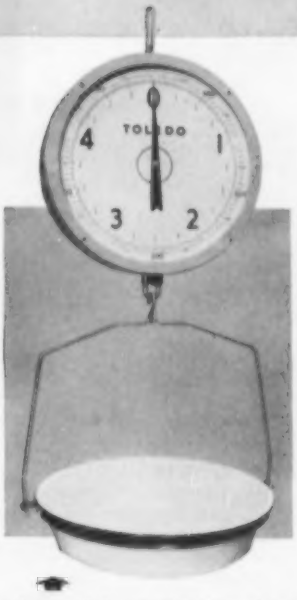
For more information circle No. 45 on the Reader Service Card

DIE CASTING REPORT

Half a million---or a few hundred---designing parts for die casting can pay off big!

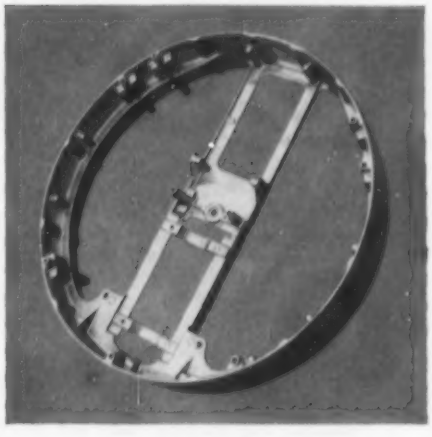


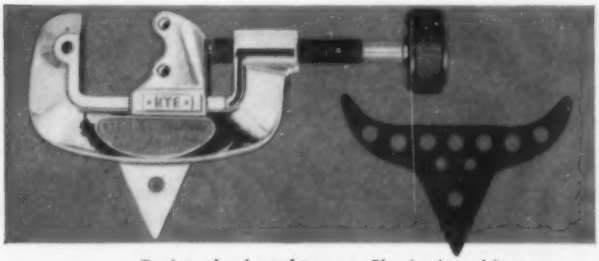
Radio Dial Housing: Production better than half a million. Features: thin walls and cast retaining grooves for close fit. Non-corrosive zinc alloy. Mounting bosses, normally welded on steel, are integral. Accurate cored recesses for tone control.



Aluminum dial support: Annual production in the low thousands, but die casting this unit saved weight, assembly time and machining. As an integral part of every scale, design changes are few; parts can be ordered from standing die, as needed.

Low production items, as well as those in the millions are often economical to die cast. What is the yardstick? There are many. Costs may be cut and production profits increased where intricate design and difficult contours may be impractical by other means. Die casting may save on machining; eliminate component parts and thus cut down assembly; provide more economical type of surface for plating. No matter what your production schedule may call for —investigate die casting before you decide. Let Precision engineers show you what can be done in aluminum, magnesium and zinc to lower your costs!





Resists shock and torque: Plumber's tool features perforated steel insert in zinc alloy frame. Production several thousand. Result: maximum strength, functional design at minimum cost. Chrome plating adds to wear resistance and sales appeal.

Look for these two symbols when you deal with a die casting supplier. They are your assurance of quality castings and high production standards. Precision is a pioneer member of the American Die Casting Institute and one of the founders of the Certified Zinc Plan.

PRECISION CASTINGS CO., INC.

A SUBSIDIARY OF **Harrisburg Steel** CORPORATION

FAYETTEVILLE, N. Y.—SYRACUSE, N. Y.—CORTLAND, N. Y.—NEW YORK, N. Y.
CHICAGO, ILL.—CLEVELAND, OHIO—KALAMAZOO, MICH.

For more information circle No. 82 on the Reader Service Card

DATA OFFERED IN THIS MONTH'S ADS

to get any of the free materials described here, circle the appropriate number on the reader service cards bound into this issue

2. INCREASE DIE CASTING PRODUCTION through the use of dry film lubricants. A bulletin published by Acheson Colloids Co. discusses the uses of these materials in the die casting industry.

5. HEAT EXCHANGERS to cool hydraulic oil in die casting machines are presented in bulletin 1.1K5 from Ross Heat Exchanger Div., American-Standard.

7. DIE CASTING ALLOYS, their chemistry, metallurgy, physical and mechanical properties together with suggestions on application are all in Apex Smelting Co.'s booklet "Die Casting Alloys."

8. PLUNGER RINGS of hardened steel that last in the shot cylinder of your die casting machine more than 100,000 shots per set are the subject of literature from Auto-Diesel Piston Ring.

10. INDUCTION MELTING FURNACES powered by spark-gap converter units are discussed in technical data and literature that can be secured from Ajax Electrothermic Corp.

11. DIE CASTING MACHINES in a full range of size and capacities are listed and their characteristics given in information from B & T Machinery Co.

13. PLUNGER TIPS for cold chamber die casting machines are said to last longer when made of beryllium copper. Technical bulletin No. 29 from The Beryllium Corp. discusses these tips.

14. MULTIPLE DRILLING of from 2 to 8 holes at the same time can be done with the Multi-drill. Catalog No. 851 from Commander Mfg. Co. describes and illustrates these drill heads.

15. STANDARD AND SPECIAL ALLOYS in all castable metals are listed and fully described in the MasterMet bulletin of technical data from Cannon-Muskegon Corp.

16. HOT CHAMBER MAGNESIUM die casting is made possible by a new hot end attachment introduced and described in literature from Cast-Master.

17. FIRE-RESISTANT HYDRAULIC fluid for all hydraulic systems and air compressors are described in technical data available from the Celanese Corp. of America.

18. PERMANENT MOLD or semi-permanent mold castings in aluminum made to close dimensional tolerances, high uniformity and good surface are discussed in a brochure from Centr-O-Cast & Engineering.

19. METAL POWDER PARTS in steel Oilite exhibit high strength and high ductility, comparable to low carbon steel. The properties and uses of this material are given in a new bulletin STM-54 from the Chrysler Corp., Amplex Div.

22. UNIVERSAL DIE CASTING MACHINES that are said to be entirely new are described in model 400-N bulletin from The Cleveland Automatic Machine Co.

23. CRUCIBLE PUBLICATIONS is a catalog of the publications of the Crucible Steel Co. of America. All available publications of the company are listed in this guide.

25. CATALOG OF DIE COMPONENTS to lower tooling costs and speed up mold building is available from Detroit Mold Engineering Co.

27. EJECTOR HOUSINGS for die casting dies are furnished in standard stock sizes, ready for installation. The Detroit Mold Engineering Co. catalog describes these components.

29. COMPLETE INFORMATION on dry hearth, side dip-out furnaces is contained in engineering bulletin No. C-80 from Eclipse Fuel Engineering.

30. METAL WORKING LUBRICANTS for die casting, machining, etc. are featured in bulletins available from Fiske Bros. Refining Co.

32. TINY DIE CASTINGS, a booklet from Gries Reproducer Co. describes the facilities of the company for making small zinc base die castings and shows a few.

33. ENGINEERING DATA, technical information, and recommended design and end-use material, are included in a new booklet on zinc base die casting alloys prepared by Henning Bros. & Smith.

35. COST REDUCTIONS through the use of die castings by the Hoover Co. are explored in a booklet "Die Castings."

36. DIE CASTING MACHINES that are described as being "all new" are listed and all pertinent size and operational data given in literature from Hydraulic Press Mfg. Co.

37. WIDE SWING POLISHING and buffing lathes up to 50 HP as well as standard sized models are listed and described in the Hammond Machinery Builders' catalog.

40. CUT PRODUCTION COSTS by eliminating machining and assembly operations. A brochure published by the Investment Casting Co. describes and illustrates how this can be done.

41. NEW TRIM PRESSES especially suitable for removing flash from die castings are introduced in bulletin 1956 from Johnson Machine and Press Corp.

42. DIRECT CASTING of investment castings with a Detroit furnace is discussed in a bulletin on type IC units from Detroit Electric Furnace Div., Kuhlman Electric Co.

43. DIE CASTING MACHINES that consistently produce aluminum castings with a hardware finish are described in the new Kux Machine Co. catalog.

44. INCREASED PRODUCTION of die castings, from 15% to 25% per day is said to be possible with the new Lake Erie Engineering Corp. machines. Bulletin 255 describes and illustrates these units.

45. DIE CASTING MACHINES in a complete range of capacities and types are the subject of the Lester Press offered by Lester-Phoenix.

46. MELTING FURNACES for non-ferrous metals that are either electric or fuel fired are described in new bulletins that are offered by Lindberg Engineering Co.

47. DESIGN INFORMATION to help in the proper and most economical application of aluminum and magnesium die castings has been prepared by Litemetal Dicast, Inc.

55. VACUUM DIE CASTING is now economically possible. Nelmor Mfg. Co. has information on the process.

57. ZINC DIE CASTINGS, their economy, production and uses is the subject of a booklet issued by The New Jersey Zinc Co.

58. "INDUSTRIAL LOCATION FACTORS" a booklet prepared by the Department of Conservation and Development of the State of North Carolina deals with the factors that influence geographical location of industry, with special reference to the advantages of North Carolina.

59. DECREASE POWDERED METAL fabricating costs through the use Plast/iron. A bulletin from the Plastic Metals Div., National-U.S. Radiator Corp. describes this material.

Continued on page 18

let us show you how centr-o-cast aluminum castings like these can improve your products

● Here at Centr-O-Cast we can help you improve your products by giving you careful attention to detailed requirements, close-tolerance uniformity and on-schedule delivery on permanent or semi-permanent mold, centrifugal or centrifuge aluminum castings. We can help you quality-wise while still keeping unit costs in line.

Working in all the aluminum alloys, either regular or heat-treated, we are equipped to produce for you castings ranging from 2 ounces to 65 pounds.

Write and tell us your casting problem. A card will bring an illustrated brochure, or, if you prefer, a personal call by our casting consultant.

centr-o-cast

CENTR-O-CAST AND ENGINEERING COMPANY

45 St. Jean Avenue, Detroit 14, Michigan

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You should try the newly-developed iron powder for sintered parts

PLAST/IRON

GRADE B-261

- eliminates copper
- increases elongation
- reduces growth
- saves 1¢ to 3¢ per pound

WRITE FOR YOUR FREE BULLETIN ON THIS MATERIAL

PM
PLASTIC METALS

ELECTROLYTIC IRON POWDERS • REDUCED IRON POWDERS
NICKEL • MANGANESE • SILICON POWDERS

HIGH PURITY AND SUPER PURITY ELECTROLYTIC IRON
VACUUM FURNACE MELTING STOCK

PLASTIC METALS
DIVISION OF *National-U.S. Radiator Corporation*

342 Madison Avenue, New York 17, New York
3456 Bridge Street, Johnstown, Pennsylvania
400 West Madison Street, Chicago 6, Illinois

For more information circle No. 59 on the Reader Service Card

DATA IN ADS
continued from page 16

63. UNBREAKABLE PLUNGER RINGS for die casting machines that give from 8 to 10 times the average life of conventional rings are described in data and technical sheets from Precision Piston Ring Co.

64. DIE CASTING MACHINES with positive mechanical locking action and other advanced and special features are described in the complete specification and information catalog from Reed-Prentice Corp.

65. "MACHINING ALUMINUM," a publication of the metallurgical department of The George Sall Metals Co., Inc. gives the know-how of successful machining on aluminum parts.

67. FULLY AUTOMATIC or semi-automatic powdered metal presses are described and the specifications given in bulletin 670 from the F. J. Stokes Machine Co.

73. CHEMICAL POLISHING and protective coating of zinc base die castings can be done in one step with the new Iridite. Detailed technical information is available from Allied Research Products, Inc.

75. PREVENT OXIDATION of aluminum to preserve the sectional thickness and electrical properties. Complete details on Kenvert 40 are available from the Conversion Chemical Corp.

76. HOW TO CONVERT a hand-operated drill press to automatic operation by using an air-operated, hydraulically controlled drill feed is explained in a booklet from General Pacific Corp.

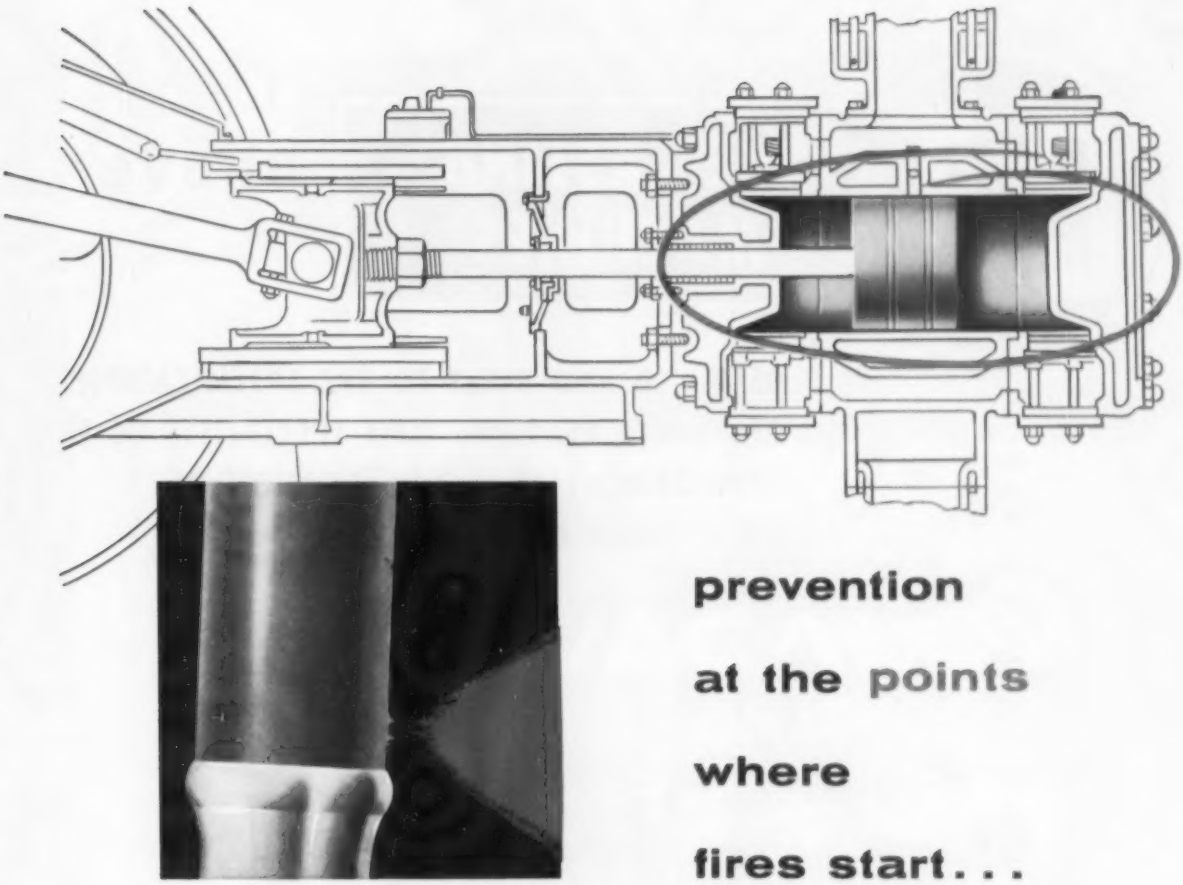
77. LIQUID COMPOUND for all metal finishing operations is described in a folder published by Hanson-Van Winkle-Munning Co.

78. THREADED INSERTS for every purpose are described in three new booklets that have been prepared by the Heli-Coil Corp.

79. BARREL FINISHING by the Honite method is said to be cheaper and better. A booklet, "Facts & Figures" has been prepared on the method by Minnesota Mining & Mfg. Co.

80. DEBURRING INACCESSIBLE hole faces is a machine operation with Nobur tools. A folder issued by the Nobur Mfg. Co. describes the operations and the tools.

81. CLEANING METAL the best, fastest and most economical way is described in a booklet "Some Good Things to Know about Metal Cleaning," issued by Oakite Products, Inc.



prevention

at the points

where

fires start . . .

Fire-resistant Celanese* Cellulubes*

Synthetic lubricants and power transfer fluids are now available in 6 controlled viscosities

Celanese Cellulubes are fire-resistant synthetic oils, designed to provide protection against fire hazards and explosion inherent in many industrial operations.

As air cylinder lubricants in compressed air systems, Cellulubes prevent the formation of excessive carbon deposits—No. 1 source of compressor fires and explosions. They are excellent lubricants—highly stable, non-corrosive, non-foaming.

As the hydraulic fluid in diecasting and similar critical operations, Cellulubes reduce the ever-present danger from uncontrollable fires due to line breaks or other failures. Chemical compounds that contain no additives, Cellulubes' physical properties are exceptionally stable under continuous duty.

6 CONTROLLED VISCOSITIES

With the expansion of the Cellulube series to 6 controlled viscosities: 90, 150, 220, 300, 550, and 1000 (S.U.S. @ 100° F.), the way is open to replace flammable fluids in many hazardous applications. If you would like to evaluate Cellulube in your own operation, use coupon below to order working samples and complete use data. Celanese Corporation of America, Chemical Division, Dept. 589-B 180 Madison Avenue, New York 16, N. Y.

Celanese* CHEMICALS

*Reg. U.S. Pat. Off.

Celanese Corporation of America, Chemical Division, Dept. 589-B, 180 Madison Avenue, New York 16, N. Y.

Please send me working sample and technical bulletin on Cellulube for air compressor service____for hydraulic systems____. Send technical representative____.

Name_____

Title_____

Company_____

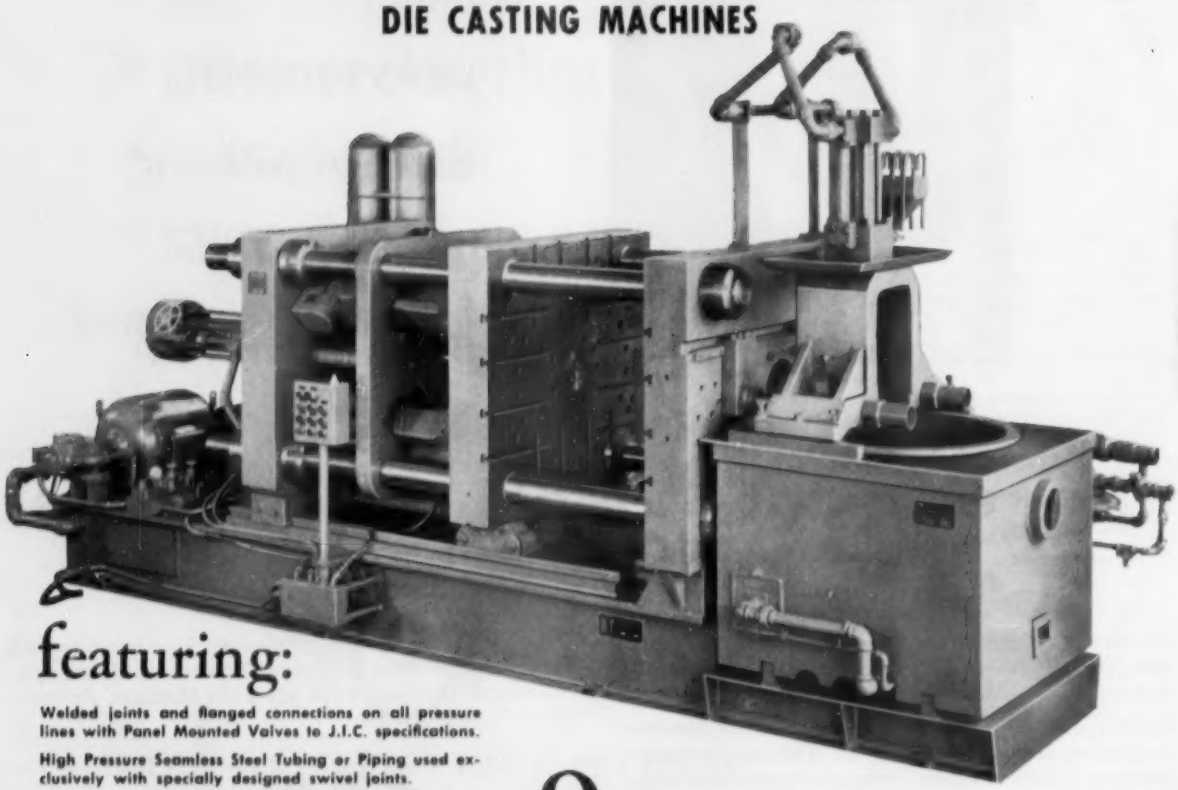
Address_____

City_____ Zone____ State_____

For more information circle No. 17 on the Reader Service Card

B&T DIE CASTING MACHINES

DESIGNED AND BUILT TO THE SPECIFICATIONS OF PRACTICAL, LONG-TIME SPECIALISTS IN THE DEVELOPMENT AND CONSTRUCTION OF DIE CASTING MACHINES



featuring:

Welded joints and flanged connections on all pressure lines with Panel Mounted Valves to J.I.C. specifications.

High Pressure Seamless Steel Tubing or Piping used exclusively with specially designed swivel joints.

Model illustrated is our B&T-700P2. 750-ton locking pressure. 29" between bars, with 5" bars.

9 MODELS TO CHOOSE FROM:

ranging from 150 to 750 tons. Available for zinc, aluminum, magnesium and brass. Write or phone for complete details.

VACALOY DIE CASTING PROCESS:

B&T zinc die-casting machines incorporating this system are now in successful operation.

B & T ENGINEERING and SALES COMPANY
112 MADISON AVE.
DETROIT 26, MICHIGAN
PHONE: WO 5-3140

B & T MACHINERY COMPANY PHONE 2341 201-217 Eighth St. Holland, Mich.

For more information circle No. 11 on the Reader Service Card

now available to the die casting industry

NELMOR VACALOY VACUUM PROCESS

Nelmor presents the first practical, production-proven, vacuum die-casting process... to produce zinc castings of quality and uniformity never before attained at normal operating speeds. The Nelmor Vacaloy Process drastically reduces porosity... improves surface finish... and increases skin density. Castings require less surface preparation for plating... offer higher corrosion resistance. Hardness and tensile strength are greatly increased... metal and die costs, scrap loss, and rejects are reduced. NO CHANGES NECESSARY ON YOUR PRESENT DIES! Nelmor will furnish equipment and engineering service to convert your machines to this process at a nominal cost... or new machines can now be purchased already Vacaloy-equipped.

LICENSE APPLICATIONS NOW BEING ACCEPTED. INQUIRE FOR MORE INFORMATION.

nelmor MFG. CO.

26420 Lakeland Blvd., Euclid, Ohio, REdwood 2-8300

For more information circle No. 55 on the Reader Service Card

Never before on a Power Plane... a motor that spins at 25,000 RPM!

CASE HISTORIES FROM MT. VERNON FILES

No power plane before this Porta-Plane* has ever used such a high speed motor. And when any manufacturer is out to break all precedents, and still sell his product at a low price, he needs every bit of designing and production skill he can find—anywhere.

This manufacturer found these in generous abundance at Mt. Vernon. The 8 principal parts of the frame of the Porta-Plane were designed to obtain the special advantages of die casting: thin wall sections of great strength and rigidity, negligible machining, smooth finish, high speed production, low cost.

This important advantage—low cost—stems directly from the way we are organized here at Mt. Vernon. From die cast to finished casting, Mt. Vernon has both the complete die casting service and the facilities it takes to produce parts like these at minimum cost in any quantity. We have 162,000 square feet of the most modern equipment for making dies and for die casting aluminum and zinc. Mt. Vernon service comprises completely coordinated designing, die-making, casting, and machining, all under one roof.

It will pay you to bring your production specifications to us. We may show you, as we did Porter-Cable, the way to important cost reductions and improved products.

MT. VERNON
DIE CASTING CORP.
STAMFORD, CONNECTICUT

For more information circle No. 53 on the Reader Service Card

NAMES IN THE NEWS

The appointment of **G. S. Corigliano** as advertising and sales-promotion manager of *Bart-Messing Corporation* was recently announced.

Federated Metals Division, American Smelting & Refining Company has promoted three men in a shift of key personnel: **George M. Baumann,** assistant general manager of the Midwestern Department, has been transferred to New York as assistant to **Frederick Walker,** who is assistant to the president. **James F. McQuillan,** who had been manager of the Houston, Texas plant, has been named to Mr. Baumann's earlier position, while **M. Robert Herman,** formerly assistant to the manager of the Houston plant, moves up to manager of the Houston plant.

The *Claud S. Gordon Company* announces the appointment of **Robert L. Dietz** as district manager.

The appointment of **Perry C. Smith,** as manager of the Equipment Department of the *Brush Electronics Company* was recently announced.

Bart-Messing Corporation has announced that **Ruco, Inc.,** is acting as distributor of their Sel-Rex filters for liquid clarification and solids recovery.

Titanium Metals Corporation of America announces further extensions of organization in sales service with the establishment of a Cleveland District Sales Office. **James C. Coffman** has been appointed manager of sales for the new Cleveland District.

Joseph W. Colby has joined the Newark office of *Acheson Industries, Inc.* as assistant to the technical director, **Mr. Raymond Szymanowitz.**

The appointment of **William J. Fath** as production control manager has been announced by *The Hydraulic Press Manufacturing Company.*

Lee R. English has been named sales manager of the *Cleveland Tool & Die Company* and the *Cleveland Grinding Machine Company.*

John D. Knox has joined *Sintercast Corporation of America* as manager of production, and **John B. Adamec** has been appointed as chief metallurgical engineer, responsible for process and quality control in the production department.

"Hmm—maybe if we modify our tools a bit, we'll reduce our aluminum machining problems"

Good idea, I'll finish my sandwich. Then send for a copy of George Sall's 4-page booklet "Machining Aluminum".

This booklet is written in shop terminology offering economical solutions to everyday machining problems.

Copies of "Machining Aluminum" are available without obligation . . . write to our Metallurgical Department.

This is only one of the research and service facilities offered to industry by our company. In addition to controlling our quality with the most modern techniques known, our Metallurgical staff is always at your service. They will be glad to consult with you on any problems related to non-ferrous metals. We can also develop and produce special alloys for any special requirements you may have.

For superior service in non-ferrous metals, call . . . .

"Better Alloys for Better Castings Through Creative Metallurgy"

The George Sall Metals Co., Inc.

2304 EAST BUTLER STREET — PHILADELPHIA 37, PA.

PRODUCERS OF: Aluminum, Brass and Bronze and Zinc Alloy Ingot; Hardeners, Z-shot and bar for Zamak production; Salloy; Special Alloys

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Die Slick case histories

"Your Die Slick No. 9 has enabled us to produce zinc castings with a cleaner and better surface finish."
Northern Iowa Die Caster

"With Die Slick our dies operate almost twice as long without cleaning due to practically no carbon formation on cores and ejector pins."
Large Chicago Manufacturer

"We are now casting a .045" wall casting which would not be possible without Die Slick. Thanks for a marvelous product."
Midwest Diecasting Jobber

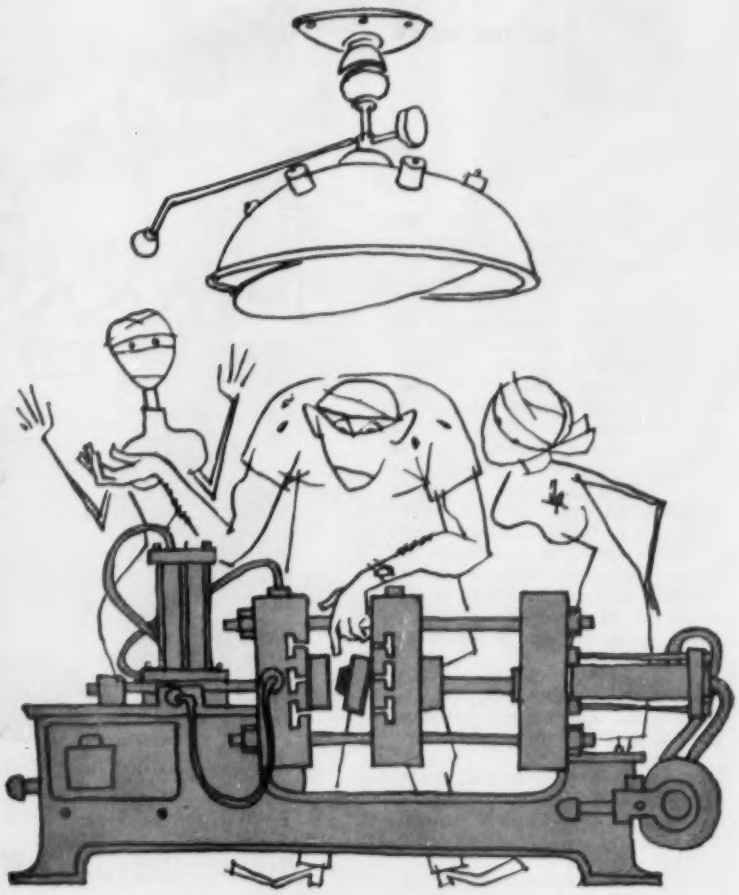
"Die Slick has increased our production rate and improved the quality of our castings."
Michigan Manufacturer

"Your Plunger-Slick is the greatest plunger lubricant we have ever used . . . and we have tried them all."
Western Diecaster

"I have been with the pressure die casting business since its experimental stages and have tried everything imaginable to prevent galling and still get good surface finish . . . and can truthfully say Die Slick No. 3 is the very best."
Well-known Southern Diecaster

"On hardware jobs it (Die Slick #9) has shown a marked improvement on the finish of the castings."
Large Chicago Diecaster

"We are using Die Slick by the 55-Gal. drum because it keeps our scrap down to a minimum and our die cavities free from scale."
Large New Jersey Producer of Automotive Hardware



Quick Nurse...Die Slick!

Removing stuck castings from a diecasting machine can be a big operation . . . a costly one, too. Preventive medicine starts with Die Slick, the die lubricant used by 80% of the diecasting industry to prevent sticking, staining, ejector pin wear, and die damage. Die Slick comes in six grades . . . there's one suited to your exact need. Try a week's supply in your plant at our risk—simply specify the metal or alloy you are casting.

Die Slick is a registered trade mark of G. W. Smith & Sons, Inc.

DIE SLICK

used by die casters everywhere

G. W. SMITH & SONS, INC., 5400 KEMP ROAD, DAYTON 3, OHIO

For more information circle No. 66 on the Reader Service Card

USCO K-Z

USCO K-Z Aluminum Die-Casting Alloy is a high zinc variation of the popular USCO K. In other words, USCO K-Z is an AXS-679 Revision 3 alloy with zinc up to 2% maximum. The physical properties of K alloy are retained in the K-Z alloy, at a price saving to you.

USCO K-Z, like all other USCO Aluminum Alloys, is production and quantometric controlled from raw materials to finished ingot under the most modern methods of alloying and refining—giving you the properties you desire in your castings.

As with all USCO Alloys, if you desire, K-Z can be tailor-made to fit your specific needs.

Let our metallurgical engineers, who have a practical working knowledge of die-casting, aid you in selecting the correct alloy and assist you with your melting and casting problems.

USCO

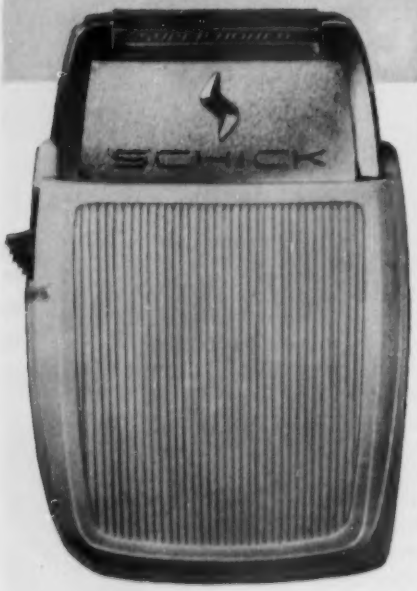
U. S. REDUCTION CO.

East Chicago, Indiana

PLANTS: EAST CHICAGO, INDIANA • TOLEDO, OHIO

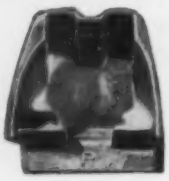
For more information circle No. 71 on the Reader Service Card

Streamlined metal parts of the NEW SCHICK "25"



—produced by the Millions at high speed and low cost with DOLLIN ZINC DIE-CASTINGS

Right and left hand "Whisk-its" which snap open for easy cleaning. Final plating is bright chrome.



Nameplate has sharply defined raised insignia and recessed letters. Finished in a soft silvery satin, with letters painted black.

Shaving Head Divider is cast to accurate tolerances. Finish is bright chrome plating.

Every part is smooth and clean as a Schick Shave!

The beautiful new Schick "25" Shaver is an ideal example of how Dollin's advanced die-casting techniques can faithfully reproduce the designer's art in high-speed, mass-produced volume, at extremely low piece cost.

All parts are delivered to Schick smooth, clean, accurate, ready for plating. No machining is required. Volume schedules are easily met because of the exceptionally high-speed output of Dollin's specially-designed, fully-automatic zinc casting machines for small parts production.

From print to product, Dollin offers bonus values to volume users of die-castings. Fullest engineering cooperation—specialized, high-speed equipment—big capacity for mass-production runs—complete die-making and machining facilities—fast, dependable service—exceptionally low costs. Send prints or samples for quotation.

All Commercial Sizes

•

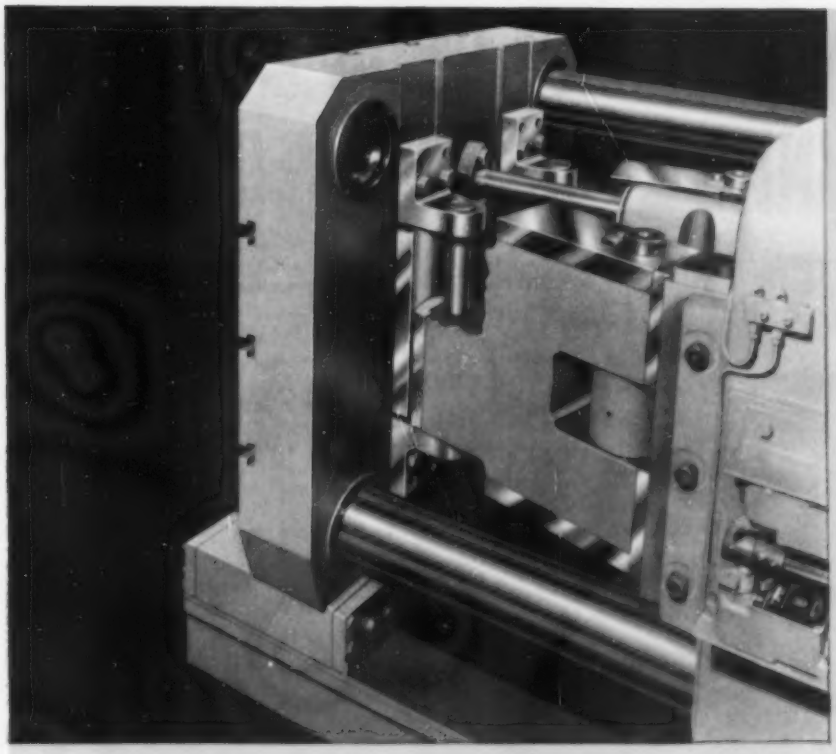
Special small castings department

DOLLIN CORPORATION, 614 So. 21st., Irvington, 11, N. J.

Sales Offices: Boston • Buffalo • Canton • Charlotte • Chicago • Detroit • Louisville • Philadelphia • Pittsburgh • St. Louis • St. Paul

DOLLIN Zinc & Aluminum DIE-CASTINGS

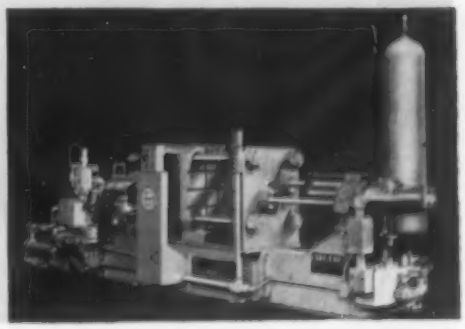
For more information circle No. 26 on the Reader Service Card



15% to 25% MORE DIE CASTINGS PER DAY

with new knuckled Wedge Cam Toggle

- Time saved on adjustments and die set up with Wedge Cam Toggle gives you from 15% to 25% more time in actual production. The Wedge Cam Toggle is an accurate, self-compensating clamp. It automatically takes up clearances in the dies caused by contraction and expansion of the molds during production or shut-down periods. Wedge Cam Toggle also makes it possible to set dies in a single cycle in many instances. All models of the new Series D "expandable" die casters incorporate the new knuckled joint to eliminate shear stress on the pins.



LAKE ERIE
DIE CASTING MACHINES

LAKE ERIE ENGINEERING CORPORATION
520 Woodward Avenue, Buffalo 17, N.Y.

LAKE ERIE

TYPICAL DIE CASTERS *who use Lake Erie Machines*

ALLIS-CHALMERS MFG. CO.
BENDIX AVIATION CORP.
JOHNSON MOTORS
KIEKHAEFER CORP.
DAVIDSON MFG. CO.
THE DOW CHEMICAL CO.
LUDMAN CORP.
GENERAL ELECTRIC CO.
GENERAL CONTROLS CO.
GENERAL MOTORS — TERNSTEDT DIV.
HUNTER FAN & VENTILATING CO.
BOHN ALUMINUM & BRASS CORP.
CENTRAL DIE CASTING & MFG. CO., INC.
THE ELECTRIC AUTO-LITE CO.
MCCULLOCH MOTORS CORP.
OUTBOARD MARINE & MFG. CO., LTD.
RUPERT DIECASTING CO.
SUPERIOR DIE CASTING CO.
WESTINGHOUSE ELECTRIC CORP.

SEND FOR NEW BULLETIN 255
(Ask about 16mm. film)

For more information circle No. 44 on the Reader Service Card

NEW GRC TINY DIE CAST PARTS EMPHASIZE BIG OPPORTUNITIES FOR IMPROVED DESIGN

NOW! Design change problems minimized because Gries' techniques are flexible, adaptable.

Design engineers find their work simplified by utilizing the unique die casting techniques developed by Gries Reproducer Corporation.

Gries manufactures simple or intricate zinc alloy parts in one high-speed, economical process. Problems such as additional manufacturing operations to produce slots, square holes, flats on round surfaces, etc. can usually be eliminated. GRC zinc alloy die cast parts are turned out completely trimmed, ready for use, in one automatic operation by Gries *exclusive* methods.

All this adds up to exceptional economy in the production of small parts, whether making changes in existing designs or planning new ones.

Gries' small parts are made to precise specifications. Maximum length 1¾ inches, maximum weight ½ ounce; smallness unlimited. All are mass-produced at low cost in quantities of 100,000 to many millions.

Send for Gries' fact-filled bulletin on tiny die castings today.

Gries Makes Extensive Line of Die Cast Zinc Alloy Threaded Fasteners

Gries produces by their exclusive die casting technique a line of high quality, low cost threaded fasteners, including wing nuts, cap nuts, wing screws, round-head thumb nuts, round-head thumb screws, rivets, which are available in a wide range of sizes. Quick delivery from stock. Special to order. All are non-ferrous, rustproof, with clean threads and bright finish. GRC mass production techniques provide lower costs. A new bulletin is now available. Write for your copy of Gries Industrial Fasteners Bulletin.

Exclusive Production Facilities Offered by Gries

At the modern Gries plant in Westchester County, New York, production facilities are geared to turn out quantities of 100,000 to many millions, completely trimmed and degated, ready for use. Smallness is unlimited: maximum weight ½ oz., maximum length, 1¾ in.

Gries also has full facilities for secondary operations such as tapping, drilling, assembling, reaming, special machining and surface finishing. Practically all commercial finishes can be applied to GRC zinc alloy die castings.

GRC "Intercast" Die Casting Offers Multiple-Parts Units with Movable Parts

In one automatic operation, Gries can "intercast" die cast tiny parts with movable elements, completely assembled, trimmed and ready to use. Elements fit precisely, yet move freely. Production of individual multiple-unit products or continuous "intercast" units is fast, economical and unique.

The "sister-hook", picture frame swivel rings, scissors, loose-leaf binder rings are 2-element movable "intercast" parts, whereas the chain shown in the photo is an example of continuous "intercasting". Send for samples and full information.

WORLD'S FOREMOST PRODUCER OF SMALL DIE CASTINGS

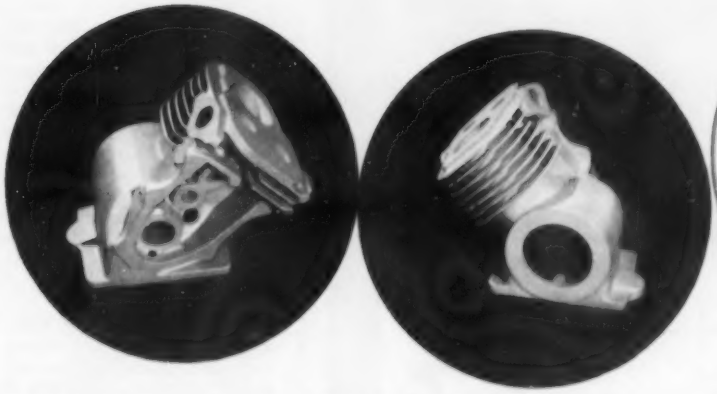
GRIES

GRIES REPRODUCER CORP.

157 Beechwood Ave., New Rochelle, N. Y. NEw Rochelle 3-8600

For more information circle No. 32 on the Reader Service Card

Plenco shell molding resins and Brillion casting skill give Reo Power Mowers cost-saving improvements



TWO VIEWS of Reo Lawn Mower motor cylinder block showing improved result of shell molds made with Plenco #47 resin. Advantages obtained include: **1**—Better tool life and higher machining speeds due to clean smooth surface finish of casting. **2**—Cleaner intake and exhaust ports with shell cores, making possible a slight increase in the horsepower of the engine. **3**—Reduction in the number of rejections due to porosity in the cylinder wall or bore. **4**—Two holes cored; previously these holes were drilled into the solid casting. **5**—Locating pads held to closer tolerance, reducing machining scrap. **6**—All core areas cleaner and overall appearance greatly improved.

Reo Model TKS-21, Power Trim, Power Propelled Lawn Mower. Its 2¼ h.p. four cycle engine utilizes the engine block casting described here.

Shell molding eliminated 190 pounds of molding material in casting four of these 11-pound gray iron cylinder blocks for the engine of the Reo Power Lawn Mower. This economy was made possible by the precision shell casting of Brillion Iron Works, Brillion, Wis., with Plenco #47 resin.

The former dry sand method required 114 pounds of molding material for two castings. The shell mold process requires only 38 pounds of molding material for four castings. Casting weight itself was reduced by one pound over the dry-sand cast part as less machining stock was necessary. Substantial savings were thus effected by Brillion in labor, time and materials. Here is another example of how a foundry, by splendid engineering, made use of the shell molding process in improving a product at lower cost.

Such savings are but a few of the many advantages offered by Plenco phenolic resins. Consult with us on your shell molding problems and the application of our various Plenco resins, solid and liquid, and also adhesives for this process.

PLENCO PHENOLICS

FOR BETTER PLASTIC PRODUCTS

PLASTICS ENGINEERING COMPANY

Sheboygan, Wisconsin

Serving the plastics industry in the manufacture of high grade phenolic molding compounds, industrial resins and coating resins.

For more information circle No. 61 on the Reader Service Card

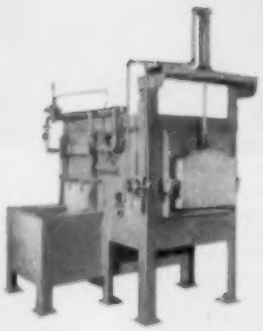
NEW ADVANCED METHOD FOR MELTING ALUMINUM

Arrangement of furnace dip-out permits close proximity to die cast machine, simplifies operation and increases production.

Newest Eclipse Furnace Joins 20 Year Veterans... Still On The Job!

• Madison-Kipp Corporation, Madison, Wis., has installed its thirty-fourth Eclipse aluminum melting furnace purchased over a 20-year period. This indicates that Eclipse furnaces offer the day-in, day-out reliable performance demanded by a large-volume maker of aluminum castings.

The newest furnaces are Eclipse Dry Hearth Soft Metal Melting Furnaces, fired by propane gas and arranged for side dip-out.



Dry hearth, side dip-out furnace

Operating temperatures range from 1120 F to 1250 F with the average operating temperature at about 1180 F. Separate melting and holding chambers provide constant pouring temperatures and improved quality control. Cold metal is preheated and melted on the sloping hearth so only molten metal enters the holding chamber. This method eliminates gas pickup and oxide inclusions and results in higher quality metal.

Eclipse builds aluminum melting furnaces for a variety of production arrangements. They are available with end dip-out, side dip-out, or double side dip-out in capacities from 300 to 2000 lb of metal per hour.

Eclipse

For complete facts, write for new Bulletin No. C-80

ECLIPSE FUEL ENGINEERING CO., 1123 Buchanan St., Rockford, Ill.

Eclipse Fuel Engineering Co. of Canada, Ltd., Don Mills, Ontario

For more information circle No. 29 on the Reader Service Card

A review of recent U.S. PATENTS

Copies of all patents reviewed can be secured from U. S. Patent Office, Dept. of Commerce, Washington, D. C. for 25¢ each.

A METHOD OF MAKING INVESTMENT CASTINGS in which the pattern, instead of being either wax or plastic, is a mixture of metal powder and a thermosetting plastic of low melting point. The pattern, which is a replica of the part to be made, has added to it a neck which acts as a source of reserve metal.

The pattern, and neck, are invested with a suitable mold-forming material and the assembly then heated. The binder and metal are melted and the metal flows into the cavity in the mold. The powder-plastic mixture must be such that expansion during heating will allow the plastic mass to move into the neck rather than to fracture the investment. On cooling, a solid metal casting is secured in the mold.

(Patent No. 2,716,791—Investment Casting—Eugene L. Schellens—issued Sept 6, 1955)

A METHOD OF DIE CASTING metals in which the object to be formed is made between an upper and a lower die. The lower die, into which molten metal is poured, has sufficient liquid capacity to hold metal for the entire part. After the liquid metal has been poured into the lower die half, the press is closed and slow, but very high pressure exerted by the upper die half. Movement of the upper die is continued until the resistance of the solidified metal will no longer permit downward movement of the upper ram of the press.

(Patent No. 2,716,792—Method of Cast-Forging Metals — Karl Kristian Kobs Kroyer—issued Sept. 6, 1955)

A PYROMETER PROTECTION TUBE for use in die casting machines casting zinc base alloys. The protection tube is of cast iron having walls approximately ⅛" thick and is nitrided to a depth of from 0.2" to 0.03" and having a hardness of 15 Rockwell N minimum. Such a tube is substantially immune to corrosion from heat and oxidation. The tube is positioned so that its closed end is immersed in the body of molten metal.

(Patent No. 2,720,786 — Heat Indicator of the Pyrometer-Thermocouple Type — William S. Sawle, Jr. — issued October 18, 1955).

Continued on page 95

ALUMINUM

QUALITY

ZINC AND ALUMINUM ALLOYS

ZINC

You can depend on it: uniform alloy quality at all times. Every step in the preparing and alloying process is governed by rigid quality controls to assure this uniformity. And most modern spectrographic equipment has been installed to safeguard your reputation . . . and ours.

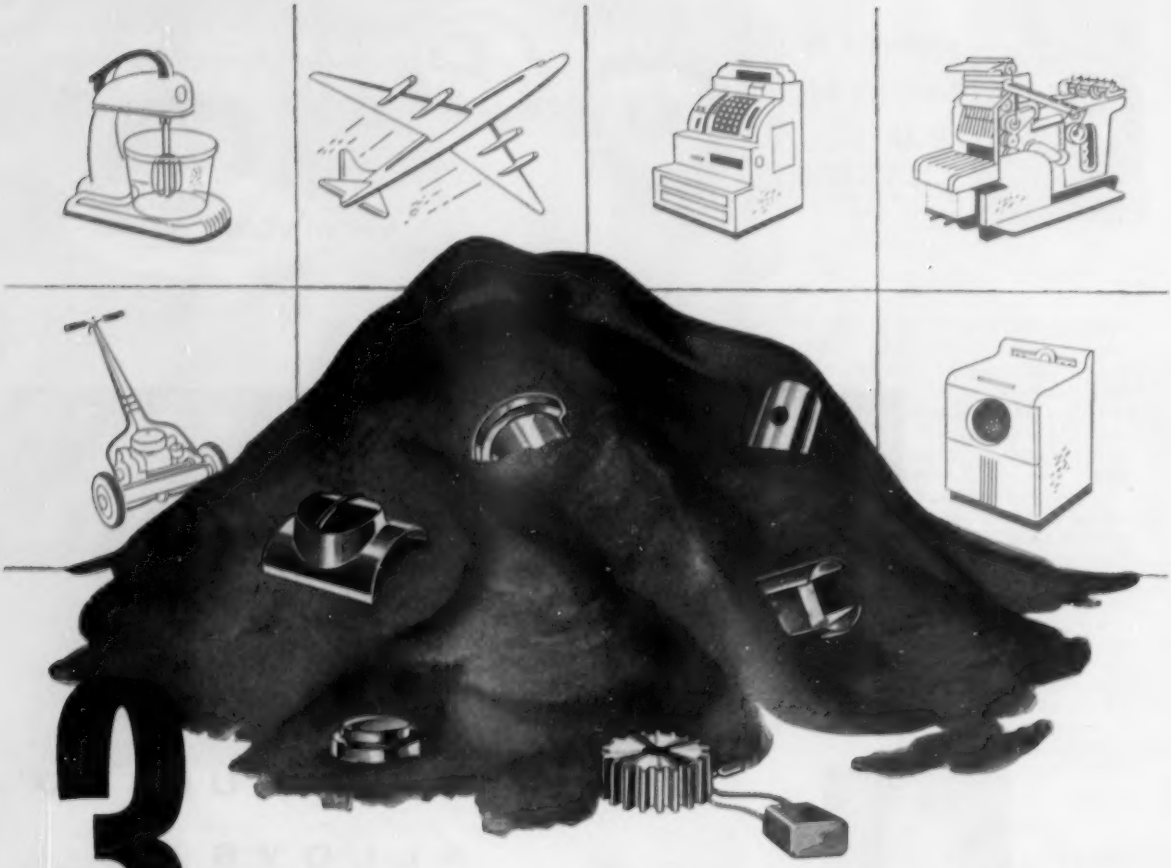
Your inquiries will receive our prompt attention

H. COHN & SONS, INC.

4528 WEST DIVISION ST. • CHICAGO 51, ILL.

Dependable Suppliers Since 1932

For more information circle No. 21 on the Reader Service Card



3 ways Glidden helps you produce better Metal Powder Parts

- ***Superior metal powders:*** Manufacturers of many products have given Glidden Resistox Metal Powders the most exhaustive tests. Result: parts made from Glidden metal powders are judged superior to parts produced from other powders and by other methods. They permit faster production, with greatly improved finish, appearance and performance characteristics.
- ***Complete field service and lab facilities:*** Glidden can assist you in setting up a metal powder parts department, or help you to improve operations of an existing department. In addition, the Glidden metal powders lab and the services of Glidden technical people are always available to your metallurgists.
- ***World's largest blender:*** Glidden can produce up to 30,000 lbs. of powder in a single batch; more than any other producer—an important factor in complete uniformity of mass-produced parts.

You may well save by re-examining the present methods you are using for parts manufacture. Be sure you are not passing up the economies, speedier fabrication and superior performance you can get with parts made from Glidden Resistox Metal Powders.

QUALITY Glidden PRODUCTS — CHEMICALS PIGMENTS METALS

THE GLIDDEN COMPANY
Chemicals — Pigments — Metals Division
Baltimore, Md. • Collinsville, Ill. • Hammond, Ind. • Scranton, Pa.

For more information circle No. 31 on the Reader Service Card

You Can't See a Crippled Heart

She doesn't use crutches, and, except for a drawn and listless expression, looks very much like any other little girl. But she is crippled. She has a crippled heart—the kind of disability you can't see.

And it may surprise you to learn that the tragedy of congenital heart disease affects more than 500,000 children of school age in the United States. For them, as for people of all ages, heart disease is a leading health problem.

Fortunately, medical research has scored dramatic victories in prevention, care and treatment of the heart disorders of young people. Some congenital heart defects, for example, now yield to surgical correction. Both initial and recurrent attacks of rheumatic fever, forerunner of rheumatic heart disease, now may be prevented in most cases.

But more research is needed if young hearts are to be saved—the kind of research supported by the Heart Fund. Indeed, the chances of many thousands of children for a full, rich and happy life depend on this research.

HELP YOUR HEART FUND — HELP YOUR HEART

Send your 1956 Heart Fund contribution directly to your local Heart Association, or to "H-E-A-R-T," care of post office.

Lindberg-Fisher manufactures all types of Aluminum Melting and Holding Furnaces for permanent mold application— Gas-Oil- Electric resistance.

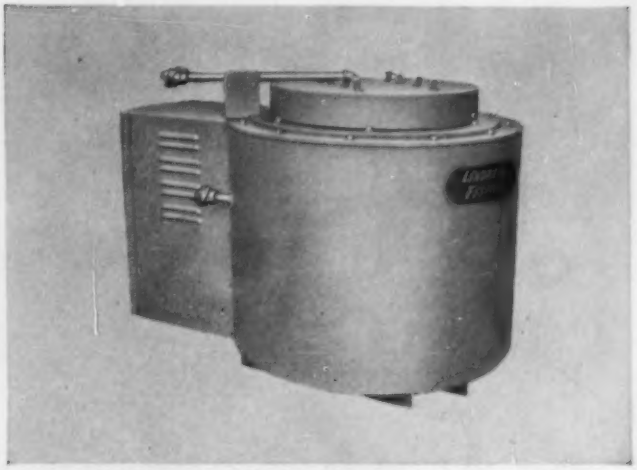
Lindberg-Fisher engineers can intelligently recommend the type of furnace to best suit your needs and conditions.

Melting specialists for 25 years
Sales and service offices in principal cities

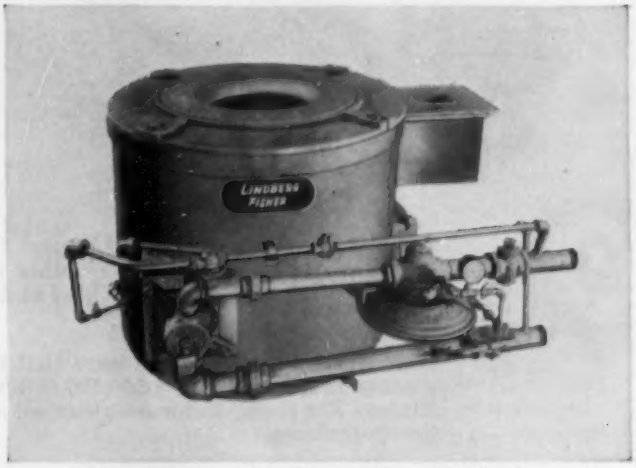
LINDBERG FISHER

MELTING FURNACES

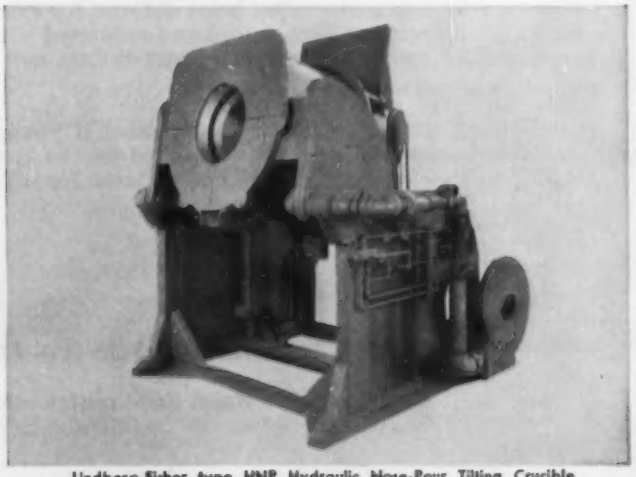
A Division of Lindberg Engineering Company, 2463 West Hubbard Street, Chicago 12, Illinois



Lindberg-Fisher Electric Resistance Aluminum Melting and Holding Furnace equipped with heavy duty resistance elements which give uniform distribution of heat, insuring long element and pot life. Capacities up to 1000 lbs. Described in Bulletin 320.



Lindberg-Fisher type ADC Aluminum Melting and Holding Furnace. Capacities up to 1000 lbs. of aluminum. Oil or gas fired. Described in Bulletin 301.



Lindberg-Fisher type HNP Hydraulic Nose-Pour Tilting Crucible Furnace. Pouring lip is located in the axis of tilting providing a constant pouring arc regardless of degree of furnace tilt. Capacities up to 1000 lbs. of aluminum. Oil or gas fired. Described in Bulletin 57-A.

For more information circle No. 46 on the Reader Service Card

YES, THEY DO HAVE PISTONS!

In looking through the December issue of PMM I do think I saw a case of some proof reader "goofing".

I without a doubt will be among many that will tell you that the 1956 Ford STILL retains the conventional type of engine! Believe that it should have been set up another 10 years.

Well at any rate I'll bet you will get a very good test of readership of the article on page 56.—S.S.

Why is it that you can proof read a page ten times and catch all the small typographical errors . . . and still miss the glaring one in the headline? Yes, our proof reader definitely goofed, as hundreds of PMM readers have brought to our attention, since seeing page 56 of the December issue. Gas turbines in passenger vehicles are still ten years from being in regular production. The heading should have read, "You may not find any pistons in your 1965 Ford . . ."

Of course, the cover photo correctly refers to the '65 Ford, as does the lead-in on page 55. Anyway, thanks to reader S.S. and the others with sharp eyes.—Ed.

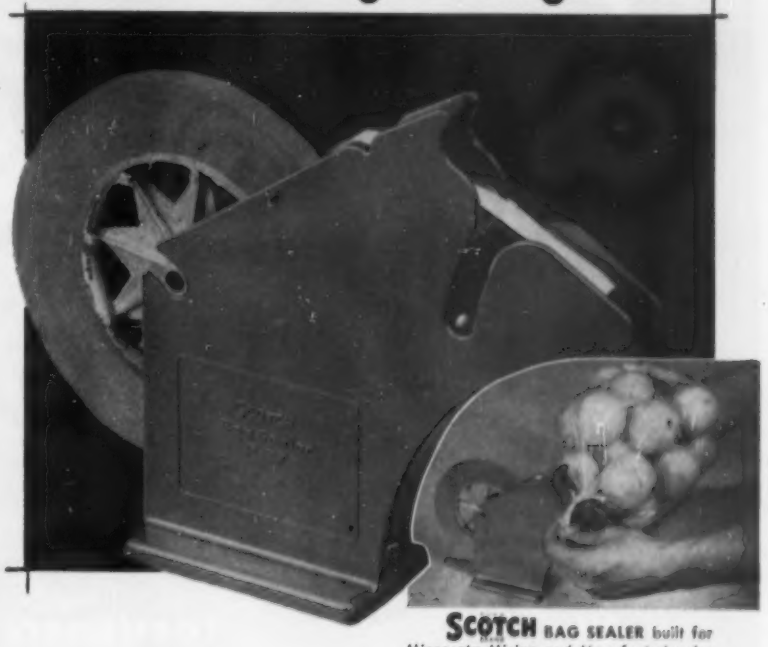
WHOSE MARK?

We are manufacturing metal elevating tables and would like to use a crank handle for the elevating mechanism the same as a sample handle we have seen. The molder of this handle has used an identification mark: and

a mold number 4711 A 14. From this information, if you can determine who the manufacturer of the handle is, we would appreciate your advising us, so we can contact them about securing handles for our tables.—J.R.

Can any of our readers help out on this?—Ed.

this manufacturer planned for die-casting savings . . .



SCOTCH BAG SEALER built for Minnesota Mining and Manufacturing by Specialty Manufacturing Co. Die castings by Twin City Die Castings Co.

here's how
TWIN CITY DIE CASTINGS
helped SPECIALTY MFG. COMPANY make die-casting pay better!

Specialty Manufacturing Company planned this Bag Sealer for die-casting from the start. Working closely with Specialty engineers, Twin City Die Castings Company developed dies and cast the two side plates, tape drum, spring cap and mounting plates. Thorough-going cooperation in planning for die-casting, made possible the utmost in die-casting efficiency . . . *plus* reduced designing costs and production lead time.

When you plan your product for die-casting by Twin City, you avoid false starts and costly design changes. Frequently it is possible to develop dies which eliminate machining operations while improving the product—you get *higher* quality and *greater* salability at a *lower* per-unit cost.

Get the facts for yourself! Find out how you can save by planning your product for die-casting by Twin City—oldest and most experienced die-casters in the Upper Midwest. Your letter or phone call will receive immediate, executive-level attention.

TWIN CITY DIE CASTINGS CO.
3351 TALMAGE AVE. S.E. • MINNEAPOLIS 14, MINNESOTA

For more information circle No. 70 on the Reader Service Card

The yellow light is always flashing in the Tool Room:—"Proceed With Caution,"—"Think First,"—"Double Check Your Lay-out Lines," etc.

But American tool makers are very progressive and so have always used the best tools with which to beat difficult production tooling dead-lines. To a great extent, this in turn has been responsible for fast improvements that have advanced the American standard of living—a fact which has not been emphasized by enough writers.

The Kipp Air Grinder does tool work in minutes that formerly took hours of hard tedious work. It was the first really high speed grinder for small diameter wheels. It created a market for millions of small grinding wheels and other cutting and polishing "bits" and disks. It has been the tool maker's best friend for 25 years.

*The pleasing, practical design and the low price of The Kipp Air Grinders are in large part due to the basic advantages of the Madison-Kipp die casting process.

Please clip this ad as a reminder to check your tool makers' benches to see if they are equipped with a full set of 3 Kipp Air Grinders (Model JA 50,000 R.P.M.—Model TT 30,000 R.P.M. and Model PVT 10,000 R.P.M.). It will pay you to do so.

kipp

MADISON-KIPP CORPORATION
213 WAUBESA STREET • MADISON 10, WIS., U. S. A.

Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

For more information circle No. 48 on the Reader Service Card

Properties & Constants of Zinc Alloys for Die Castings

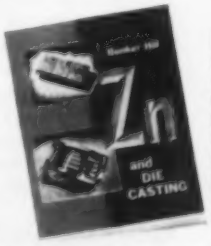
Zn

DESIGNATION	ASTM SAE	XXIII 903	XXV 925
MECHANICAL * PROPERTIES	Charpy Impact Strength, ft.-lb., ¼x½ in. bar, as cast	43	48
	Charpy Impact Strength, ft.-lb., ¼x½ in. bar, after 10 years indoor aging	41	40
	Tensile Strength psi as cast	41,000	47,600
	Tensile Strength psi after 10 years indoor aging	35,000	39,300
	Elongation % in 2 in. as cast	10	7
	Elongation % in 2 in. after 10 years indoor aging	16	13
	Expansion (growth) inches per inch after 10 years indoor aging	.0001	.0001
OTHER * PROPERTIES AND CONSTANTS (AS CAST)	Brinell Hardness	82	91
	Compression Strength psi	60,000	87,000
	Electrical Conductivity—Mhos/cm at 20°C	157,000	153,000
	Melting Point—°C	386.6	386.1
	Melting Point—°F	727.9	727.0
	Modulus of Rupture psi	95,000	105,000
	Shearing Strength psi	31,000	38,000
	Solidification Point—°C	380.6	380.4
	Solidification Point—°F	717.1	716.7
	Solidification Shrinkage—Inch/Foot	.14	.14
	Specific Gravity	6.6	6.7
	Specific Heat—cal/g/°C	.10	.10
	Thermal Conductivity—cal/Sec/sqcm/cm/°C at 18°C	.27	.26
	Thermal Expansion per °C	.0000274	.0000274
	Thermal Expansion per °F	.0000152	.0000152
	Transverse Deflection—In.	.27	.16
	Weight (Lb.) Cubic Inch	.24	.24

*Compiled by American Zinc Institute from authoritative sources

OF THE FOUR ALLOYS most commonly used for die casting – those based on zinc, aluminum, magnesium and copper – zinc offers the greatest number of desirable mechanical properties and casting characteristics at low cost. Hence, for many years, zinc has been the most widely used die casting material. Following are the inherent characteristics which account for this preference: Zinc alloys can be die cast in the highest speed machines • They are cast at lower temperatures, which minimizes fuel, die cost and die upkeep • Their impact strength is greater than that of any of the other alloys except those based on copper • They lend themselves to die casting within close dimensional limits and in varying section thicknesses • They are easily machined and are frequently used in the "as cast" condition • They are readily finished with any commercial electroplated or organic coating.

It is essential that zinc die casting alloys be formulated with Special High Grade (99.99+% pure) zinc to meet the required low limits on contaminating elements. The exacting limits on these contaminants are established in standards of the American Society for Testing Materials and the Society of Automotive Engineers and strict adherence to these standards assures the realization of maximum physical and mechanical properties. Buyers of zinc die castings can receive assurance of these superior inherent properties through reliance on the Certified Zinc Alloy Plan of the American Die Casting Institute.



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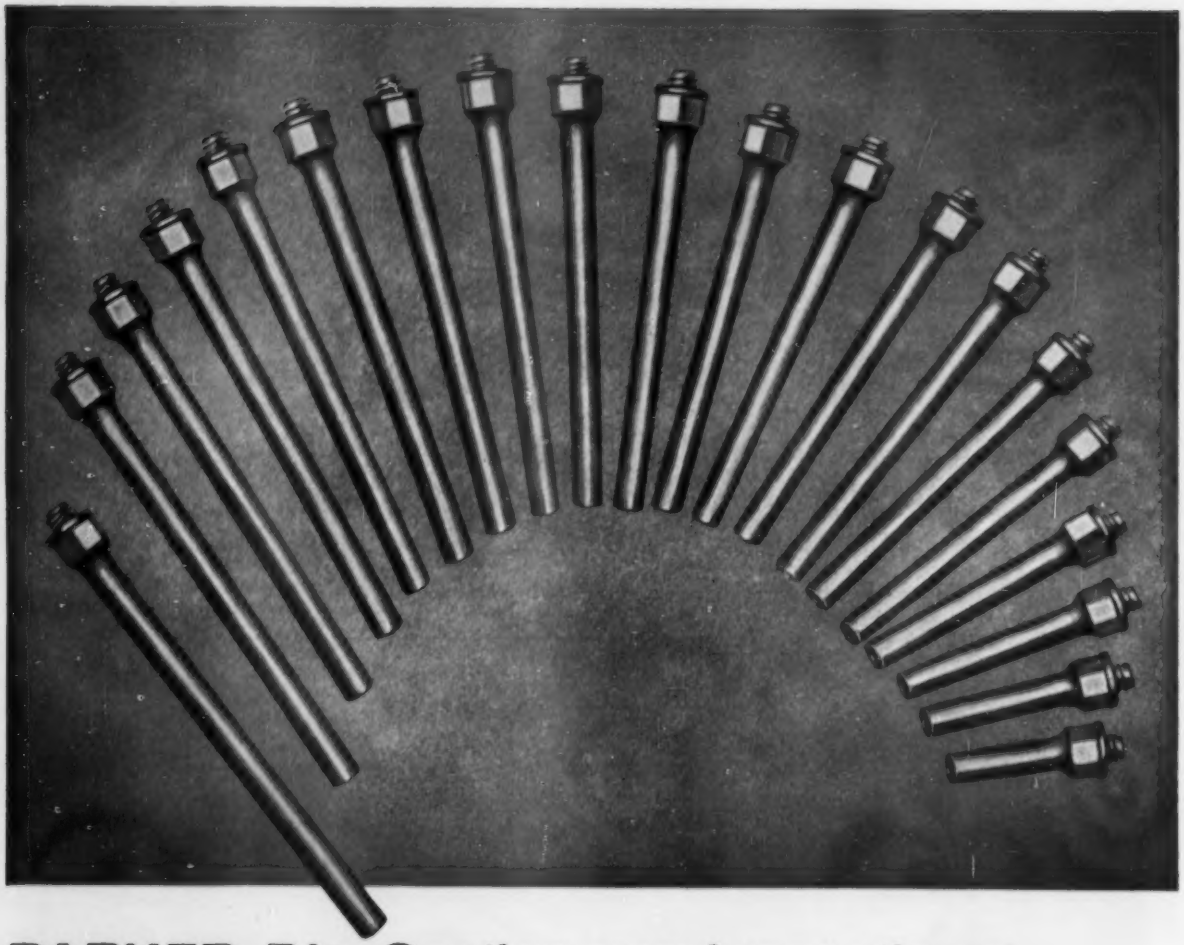

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The pieces shown are typical of parts for which the Model 640 press is particularly well suited. Difficult parts like these and pieces with double hubs, multiple levels and thin flanges all can now be made economically on the Stokes Model 640 press.

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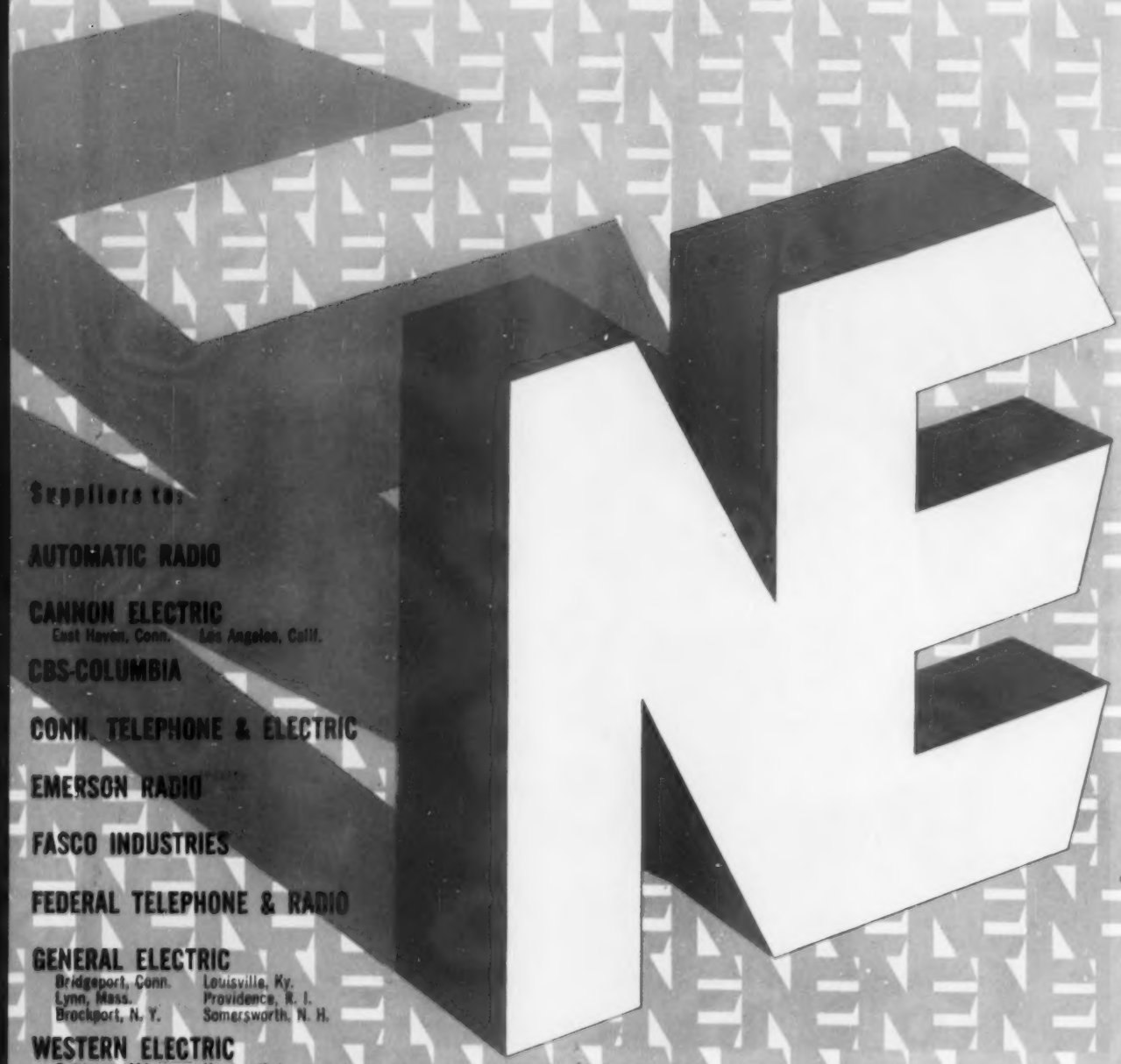

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1. PARTS THAT CAN be used in more than one model, such as parts marked "a" and "b", can be economically die cast. Body castings "c" are sand cast.

2. LIGHT WEIGHT, and superior properties, are responsible for choice of aluminum die castings used in the spray gun, *right.*

Two Alloys Give A Choice Of Properties

By **FRANK L. STOUGHTON**
Spray Engineering Co.

HOW do die castings measure up when it comes to *performance* and *final costs*? This is the question that must ultimately be answered by every design engineer specifying die cast components for his product.

Spray Engineering Company, using both zinc and aluminum alloy die castings in pressure regulators, air filters and spray painting guns, have found that careful analysis of each component, balancing the required engineering properties and cost limitations, will result in the choice of die castings where a casual opinion might have been negative.

Some of the considerations entering into the specification of die castings for this equipment are enumerated here, explaining the service conditions and cost factors that entered into the decision.

Mechanical, Chemical & Physical Properties

In the applications contemplated the chemical properties of either a zinc or an aluminum die casting are adequate. For parts that are used on the pressure reducers and the air line filters zinc die castings can be used; the units are permanently and rigidly mounted and weight is no particular problem. These parts are not subject to impact or other severe stresses.

On the hand-held spray gun, however, both the wearing qualities and the resistance to damage from rough handling indicate a need for greater resistance to abuse. Aluminum die castings are used here. Also because the gun is hand held, the weight must be kept as low as possible . . . another reason for using aluminum.

Final Cost At Assembly Level

1. *Tooling amortization.* Referring first to Figure 1, an airline filter and a pressure reducing valve are shown together with the zinc die castings used. On these two units, the body castings "c" of two different styles of pressure reducing valves are sand castings. It is not possible to use the same body casting design for these two applications and the number of castings needed, both per run and in total, does not justify the tooling costs.

However, by proper design it is possible to use the same bon-

Continued on page 62

WIDE RANGE of shapes, sizes and applications for stainless steel investment castings is illustrated by group of castings displayed here.

Stainless Steel . . . Investment Cast

By E. L. WHITE, JR., Engineer
Austenal Laboratories, Inc., Microcast Division

IN the decade since the end of World War II the use of stainless steel parts — investment cast, has risen nearly 250%, even excluding the large number of stainless steel parts that have been investment cast for the aircraft gas turbine program.

The increasing use of the "lost wax" process for the stainless steels has followed a rising awareness in industry as to the advantages and disadvantages of the process, a process which, though some 4000 years old, is not yet fully understood, nor its capabilities fully realized.

The gain in its use is due also to the effort made by design engineers to design with investment casting in mind. The investment casting process is a highly flexible one, but to make maximum use of this flexibility when working with the stainless steels, the designer should know the process thoroughly *before* designing his part. Mold and metal temperatures, size and configuration of castings, as well as soundness and thermal history all enter into the actual properties obtained in investment castings. The better the design for casting, the better is the possibility of obtaining optimum properties in the stainless steel parts cast.

It has been said that the investment casting process does for stainless steels what die casting does for zinc-based alloys. Normally the investment casting process allows better gating than can be utilized for sand casting, therefore less difficulty can be expected in obtaining sound pieces.

Stainless steel parts produced by the investment casting process will be of high accuracy, with tolerances that can be held to within ± .005 per inch. It is possible to mass produce parts which, because of their shape, might be impossible to machine. Coring may be utilized to produce hollow sections with intricate contours even including undercuts. All these advantages allow designers to use desirable alloys which could not otherwise be used. The big plus factor is the elimination of machining of those "difficult-to-machine alloys." When considering cost, it should be remembered that parts cast in stainless steel can often be purchased at a price that is lower than the total cost of castings in low alloys that require subsequent plating operations.

The applications for stainless steel parts investment cast are virtually limitless. Pump parts, aircraft instrument parts (particularly where corrosion is a factor), milk bottle filling equipment, and pouring spouts merely suggest a myriad of other parts. Equipment that must be hygienically sterile may be investment cast with the smooth 60-90 RMS finish that can be polished to a high finish on which bacteria find difficulty in lodging.

The chart on the opposite page indicates the properties of the most common stainless steels. These are the

Continued on page 82

Representative properties of investment cast stainless steels

AUSTENITIC STAINLESS STEELS

CHEMICAL COMPOSITION

DESIGNATION	C	Mn	Si	Cr	Ni	Co	Fe	Mo	W	Others	GENERAL USE
Type 302 (AMS 5358)	.25 Max.	2.0 Max.	1.0 Max.	17.0 19.0	8.0 10.0		Bal.	.50 Max.		P—.04 Max. S—.03 Max. Cu—.5 Max.	Good corrosion resistance. Oxidation resistance to 1600°F
Type 310 (AMS 5366A)	.18 Max.	2.0 Max.	.50 1.50	23.0 26.0	19.0 22.0		Bal.	.50 Max.		P—.04 Max. S—.03 Max. Cu—.5 Max.	Excellent oxidation resistance to 2000°F. Moderate high temp. strength
Type 316 (AMS 5360)	.15 Max.	2.0 Max.	.75 Max.	16.0 18.0	12.0 14.0		Bal.	1.50 2.25		P—.04 Max. S—.03 Max. Cu—.5 Max.	Maximum corrosion resistance and moderate high temperature strength to 1600°F
Type 303	.30 Max.	1.5 Max.	2.0 Max.	18.0 21.0	9.0 12.0		Bal.	.40 .80		P—.05 Max. S—.2—.4	Free machining grade for corrosion service

	CAST-ABILITY	CONDITION	TEST TEMP. F	Y.S. 2% OFFSET psi	T.S. psi	ELONG. %	R.A. %	HARD-NESS	STRESS RUPTURE DATA 100 HR. LIFE STRESS psi	STRESS RUPTURE DATA 1000 HR. LIFE STRESS psi
Type 302 (AMS 5358)	Good	As Cast	70	30,000	80,000	40	50	$80R_b$		
		Ann'ld. (1)	70	25,000	70,000	50	70	$76R_b$		
		As Cast	1200	12,000	40,000	30	40		18,000	13,000
		As Cast	1500	10,000	20,000	30	40			
Type 310 (AMS 5366A)	Excellent	As Cast	70	25,000	60,000	40	60	$70R_b$		
		Ann'ld. (2)	70	25,000	60,000	50	60			
		As Cast	1200	20,000	50,000	20	25		24,000	18,000
		As Cast	1500	15,000	25,000	10	15			
Type 316 (AMS 5360)	Good	As Cast	70	30,000	75,000	40	50	$77R_b$		
		Ann'ld. (2)	70	30,000	70,000	50	60	$75R_b$		
		As Cast	1200	20,000	55,000	30	50		26,000	20,000
		As Cast	1500	12,000	25,000	20	40			
Type 303	Good	As Cast	70	30,000	75,000	35	35	$80R_b$		
		Ann'ld. (2)	70	35,000	80,000	40	40	$81R_b$		

MARTENSITIC STAINLESS STEELS

CHEMICAL COMPOSITION

DESIGNATION	C	Mn	Si	Cr	Ni	Co	Fe	Mo	W	Others	GENERAL USE
Type 410 (AMS 5350C)	.05 .15	1.0 Max.	1.0 Max.	11.5 13.5	.5 Max.		Bal.	.50 Max.		P—.04 Max. S—.03 Max. Cu—.5 Max.	Moderate corrosion and heat resistance; service to 1200°F. Maximum damping capacity
Type 431	.12 .20	1.0 Max.	1.0 Max.	15.0 17.0	1.5 3.0		Bal.	.50 Max.		P—.04 Max. S—.04 Max. Cu—.5 Max.	Moderate corrosion and heat resistance; service to 1500°F. Maximum tensile strength

	CAST-ABILITY	CONDITION	TEST TEMP. °F	Y.S. 2% OFFSET psi	T.S. psi	ELONG. %	R.A. %	HARD-NESS
Type 410 (AMS 5350C)	Fair	Pro. Ann. (3)	70	90,000	120,000	10	20	$25R_c$
		H.T. (4&5)	70	110,000	140,000	10	30	$30R_c$
		H.T. (4&5)	70	85,000	110,000	20	50	$24R_c$
Type 431	Fair	Pro. Ann. (3)	70	90,000	120,000	15	20	$26R_c$
		H.T. (4&6)	70	130,000	180,000	10	15	$42R_c$
		H.T. (4&5)	70	100,000	140,000	15	30	$30R_c$

(1) 3 hr. 2100°F, air cooled, 24 hr. 1550°F plus 20 hr. 1300°F (2) Oil or water quench from 1900 to 2100°F (3) 4 hr. 1200°F to 1400°F, air cool

With ASTM's B-6 Committee and SAE Standards Committee currently considering reducing the number of die casting alloy specifications this review of the history of die casting alloys is timely.

Zinc And Aluminum

THE die casting process has been aptly called "the shortest route from ingot to finished part". The tremendous growth of the industry is due partly to this fact and partly to the imagination and skill used by those engaged in making die castings to steadily improve the process and produce larger and more complicated pieces.

The production of special high grade zinc (99.99+% pure) in 1929 made zinc base die castings stable and dependable for use as engineering materials.[1] In 1935, the die casting process used 12 percent of the zinc produced, or a total of 55,000 tons.[2] In 1955, it is estimated that this total will be in excess of 360,000 tons, or 38 percent of the total use of zinc . . . the largest use for zinc except in the galvanizing process.

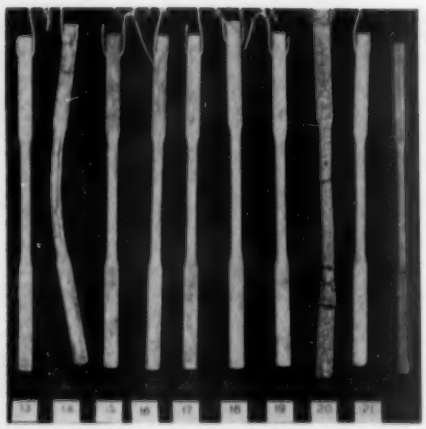
The growth in the use of aluminum for die casting has been even more striking and it is expected that 1955 production of aluminum die castings will be about 185,000 tons, or about half the weight of the zinc die castings. On a volume basis, this weight of aluminum die castings would be the equivalent of 462,000 tons of zinc.

The skill of the die maker, the improvement in the die casting machine, and the experience of the die caster, have all contributed to this growth. This article, however, deals only with the whys and wherefores of the principal zinc and aluminum alloys used today, as these have also played their part in the production of more and better die castings.

Zinc Base Alloys

The early difficulties with zinc base alloys were described by Rosenhain and Archbutt in 1912[3], and by Williams in 1917.[4] At that time, zinc die casting alloys were made of Prime Western zinc and contained tin, copper and aluminum as alloying ingredients.

Further work was done both by Rosenhain and his group in England [5, 6, 7] and by the zinc producers in this country [8], and in 1927, the American Society for Testing Materials inaugurated a test program on both aluminum and zinc base die casting alloys through its die casting Subcommittee XV of Committee B-2, afterwards known as Committee



1. ORIGINAL TEST BARS subjected to ASTM steam test in the late 1920's. As a result of this test, the number XXI test bar (now known as AC43A) was standardized.

2. DIE CASTING ALLOYS

Commercial ASTM SAE	#2 AC43A 921	#3 AG40A 903	#5 AC41A 925
COMPOSITION			
Aluminum	3.9-4.3	3.9-4.3	3.9-4.3
Copper	2.5-2.9	0.10 max	0.75-1.25
Magnesium	0.02-0.05	0.03-0.06	0.03-0.06
Iron	0.075 max	0.075 max	0.075 max
Lead	0.005 max	0.005 max	0.005 max
Cadmium	0.003 max	0.003 max	0.003 max
Tin	0.001 max	0.001 max	0.001 max

Donald L. Colwell, author of this article, was chief metallurgist for the Stewart Die Casting Corp. at the time American Society for Testing Materials organized its subcommittee on die casting alloys in 1926. Mr. Colwell was named chairman of the subcommittee II on zinc base alloys, and was chairman at the time 99.99 zinc was first introduced. He was also a member of the Society of Automotive Engineers Standards Committee at the time it wrote specifications for die casting alloys. He is still a member of that committee, and active in the ASTM B-6 Committee which has voted on reducing the number of zinc base die casting alloys to one. The question will be discussed at the 1956 meetings of the committee.

Die Casting Alloys (Part One)

By DONALD L. COLWELL
Director of Laboratories, Apex Smelting Company

B6.[9] This committee has taken the lead in testing and writing specifications for die casting alloys, consequently much of the following discussion will be based on cooperative testing done by the ASTM.

The results of the first series of tests on zinc base die castings are illustrated in Figure 1, and it is unnecessary to go into the details of all of the compositions tested, as these have been published previously.[1 and 10] It might be pointed out that No. XIV contained no magnesium and No. XX was made of zinc of 99.75% purity. The bar on the right was untested. As a result of this test, the No. XXI alloy, now known as AC43A, was standardized. This alloy was based on 99.99% zinc and contained 4% aluminum and 3% copper. The magnesium content was originally set at 0.10% but with further improvement in the purity of zinc used and further development by the die casters and the producers of the alloy,[11] a magnesium content of 0.04% was found to be satisfactory. The reduction in magnesium was opposed for some time by one of the zinc producers. Commercially called No. 2, it is now used only where hardness is desirable.

About 1932, as a result of the work of both zinc producers and die casters, it was found that the same alloy without copper gave superior aging properties and had more ductility and malleability, but was not as hard as its predecessor AC43A.[1 and 12] This alloy, No. XXIII or No. 3, now known as AG40A, was of the same composition except that the copper was held to below 0.10%. Several years later, as a compromise between AC43A and AG40A, a third alloy appeared which was standardized in 1937 as No. XXV.[12] It is now known as AC41A, or No. 5. Current specifications for the three are shown in Figure 2.[13]

Because of the superior properties of AG40A, and to some extent, AC41A, the ASTM decided to start a new exposure test based only on these three compositions, as all others had become obsolete.

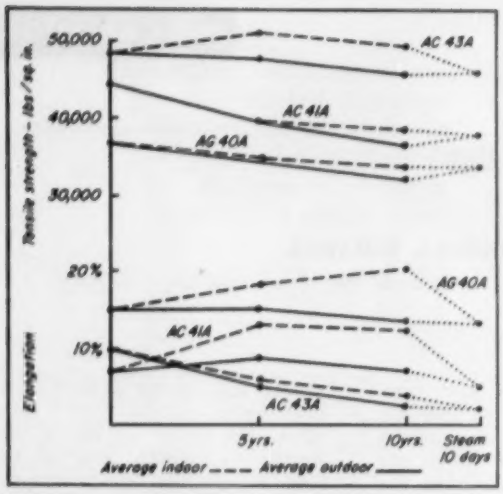
Continued next page

3. ANALYSES OF TEST BARS FOR ASTM AGING TEST

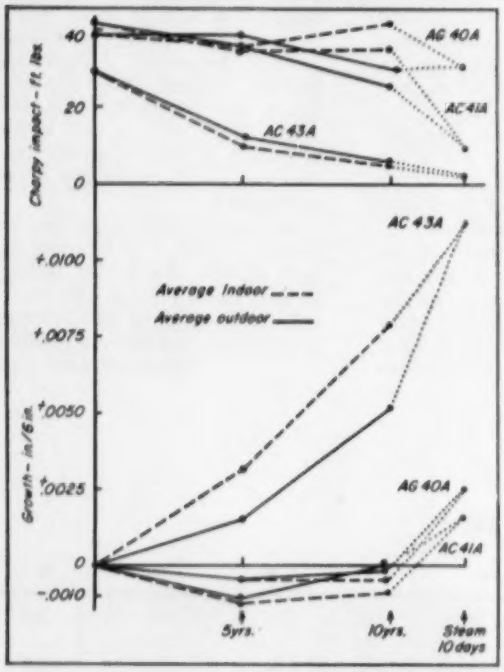
Alloy	Producers	Al	Cu	Mg	Pb	Cd	Fe	Sn	Ni
AC43A	Range of 6	3.8-4.2	2.6-3.0	.04-.06	.001-.002	<.002	.012-.026	<.001	<.005
AC43A	Spec.	3.5-4.5	2.5-3.5	.02-.10	<.007	<.005	<.100	<.005	—
AG40A	Range of 4	3.8-4.2	<.01	.04-.05	.001-.002	<.002	.006-.018	<.001	<.005
AG40A	Spec.	3.5-4.3	<.15	.03-.08	<.007	<.005	<.100	<.005	—
AC41A	Range of 6	3.9-4.2	1.0-1.1	.04-.06	.001-.002	<.002	.009-.018	<.001	<.005
AC41A	Spec.	3.5-4.3	.75-1.25	.03-.08	<.007	<.005	<.100	<.005	—

4. AVERAGE MECHANICAL PROPERTIES OF ZINC BASE ALLOYS FOR AGING TEST

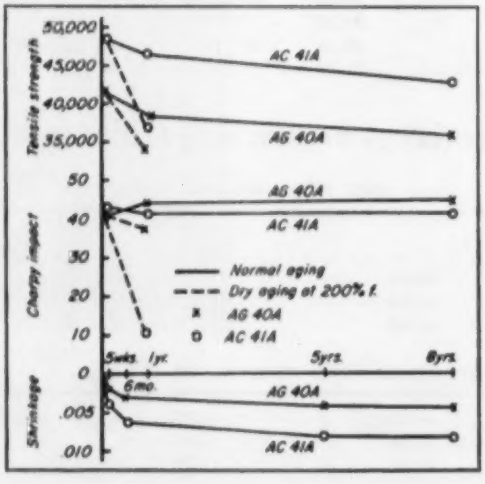
Alloy	Producers	T. S.	Elong.	Charpy	Expansion in. in 6"
AGED 3 TO 6 MONTHS					
AC43A	6	48,600	10%	29	
AG40A	4	36,900	15%	>39	
AC41A	6	44,300	7%	>41	
EXPOSED TO STEAM AT 95° C FOR 10 DAYS					
AC43A	6	44,500	2%	1	.0112
AG40A	4	33,500	13%	30	.0026
AC41A	6	37,700	5%	9	.0016



5. AGING of zinc base die castings produced results in tensile strength and elongation charted at the left.



6. AGING of zinc base die castings produced results in impact strength and growth as charted at the left.



7. NORMAL AGING of zinc base die castings, and aging at 200F by the British Standards Institution, had the results charted at the right.

Test bars were produced by six die casting producers (only four produced AG40A) and these bars were exposed at five outdoor sites and four indoor sites. The outdoor sites were at Key West, Fla.; Sandy Hook, N. J.; New York, N. Y.; Altoona, Pa.; and State College, Pa.; and the indoor sites at Coco Solo Island, Canal Zone; New Kensington, Pa.; Cambridge, Mass.; and Tucson, Ariz. All test bars produced were within the ASTM specification limits and their average compositions are given in Figure 3, along with the specification limits.[14] Original mechanical properties and properties after exposure to steam for 10 days, are shown in Figure 4. The greater stability of AG40A is apparent.

Bars from the nine exposure sites were removed and tested after five years, and again after ten years.[14] The effects of aging on tensile strength and elongation are shown in Figure 5, and on Charpy impact strength and growth, in Figure 6. All of the values from the bars exposed indoors were averaged, and all of those from the bars exposed outdoors were averaged. Some of the Key West bars were lost before the ten-year period was completed; consequently, the ten-year point for outdoor exposure does not include Key West in all cases. A study of the Key West results separately, however, indicates that the points would not have been significantly affected. The Cambridge indoor bars are also missing from the ten-year averages. The steam test results from Figure 3 are shown to the right of the ten-year results in Figures 5 and 6 for comparison.

It is evident from these curves that AC43A has the highest tensile strength and the lowest ductility as measured by elongation and by impact, and also the greatest drop in ductility with aging and the greatest growth. AG40A has the highest ductility and the best stability in elongation and impact strength and also in dimension. In steam, however, AG40A has a slightly higher dimensional change due to the fact that the steam corrodes more severely than ordinary exposure

Continued on page 78

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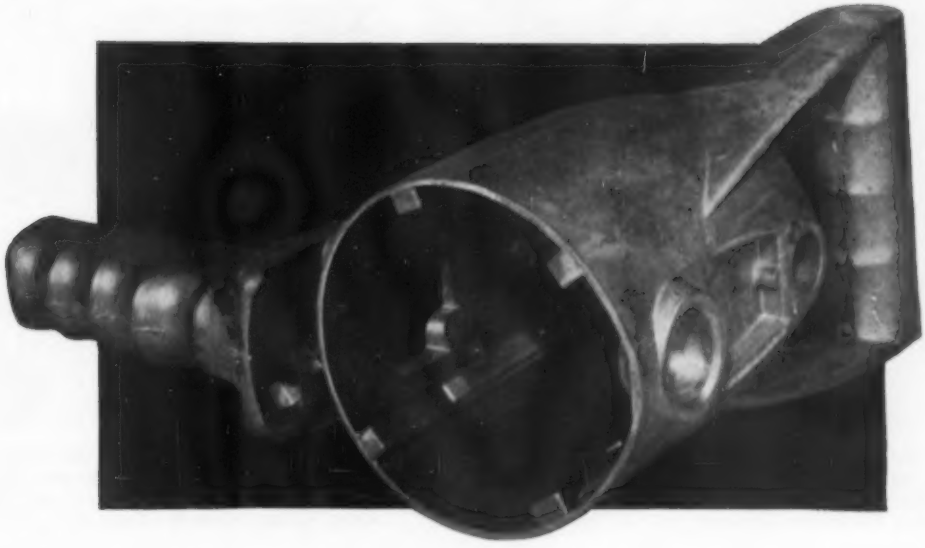

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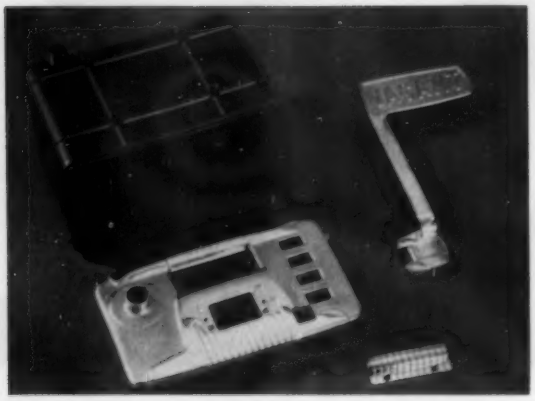
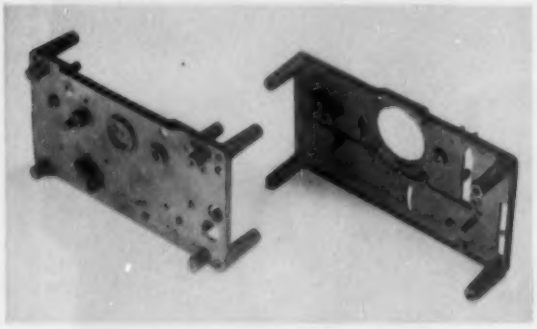
1. EVEN IN NEW YORK CITY, the ultimate testing ground for taximeters, this new Viking Meteramic 38 taximeter is proving its durability and accuracy. Direct drive construction eliminates as many as 20 gears.



3. COMBINATION FINISH is obtained by chromium plating over vari-textured surface treatment on zinc die castings. This gives both matte and luster surfaces for smart styling.



2. MATING BOSSES on these die cast frames are cast so accurately with regard to length, diameter and location that the two frame pieces are assembled by butting the bosses together.

4. TWO BUSHINGS cast as inserts in the die casting, top left, are aligned so accurately that they hold this shaft for a worm gear without requiring line reaming. Other power transmission castings are also shown.

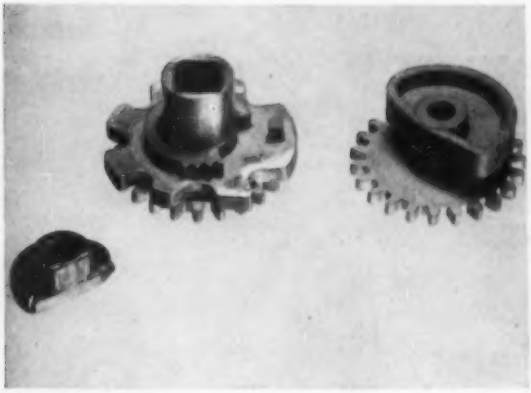
Fare Is Fair.....

TAXIMETERS take a beating. They are required to function accurately despite stresses, shock, vibration, exposure to moisture and other incidental abuses. Being a measure of passenger payment, they are legally required to operate within close limits of accuracy.

These conditions impose a severe limit on choice of materials used in taximeters. Viking Tool & Machine Corp. of Belleville, N. J., manufacturers of a widely-used taximeter that operates on an electro-mechanical system, depend upon a combination of zinc die castings and beryllium copper and steel investment castings for many of the important structural and functional components.

The Viking taximeter, Figure 1 with only 38 moving parts, uses an electrically wound clock instead of the maze of gears and springs conventionally used to accomplish dial movements. This overcomes a principal fault of some taximeters that cannot be set accurately. For example, when a meter is to change the indicated fare every 1/5 mile, it is not possible to set this mechanically more accurately than within about 200 feet. To prevent shorting passengers, most cities require that this 200 feet shall all be over the change point rather than split around it. In other words, you get 1/5 mile plus 200 feet minus nothing.

By converting the meter mechanism to an electro-mechanical system, Viking has been able to



5. BETTER DURABILITY than steel is provided by beryllium copper investment castings: flag indexing cam (a) at center and return lever cam (b) right. The actuating cam (c) at left is a nickel plated steel casting.

6. BETTER TOLERANCE on center hole of the ratchet hub (a) at right is gained by investment casting it in beryllium copper. Casting at left, brake actuated cam (b), is heat treated to Rockwell 38-42.

7. PRECISION ASSEMBLY is obtained by building this new taximeter principally of die castings and investment castings. Shown here is the assembly of the flag indexing cam.

With Precision-Built Taximeter

reduce this latitude to about 20 feet. Without infringing upon the passenger's payment only for actual mileage traveled, this meter avoids penalizing the cab company or driver for metering inaccuracies.

Zinc Die Casting... Assembly Aid

Key to the precision assembly of this meter are the front and rear mounting plates on which most bosses, pads and holes for attaching subassemblies are formed. Each of these die cast plates, Figure 2, has four corner bosses. The ends of these eight bosses are butted against each other and fastened with aluminum sleeves to complete the inner framework of the meter. *So accurate are these eight bosses on height, diameter and center distances that, without any machining, they locate the front and rear plates in close parallel relationship.*

This construction, in place of a conventional clockmakers' frame built of flat plates connected by riveted bars and spacers, is much more rigid and accurate, besides being faster and cheaper to make.

Another illustration of the close dimensional accuracy among related die cast components is the spacing of the four rectangular openings for mileage counters on the front face of the meter. The four counters are mounted against a rib on the inner frame die casting, and held in place by a single set screw through an end boss. *Without machining of either die casting, the openings on the*

Continued on page 52

Before buffing. Note the high quality surfaces on these raw Doehler-Jarvis die castings for Black and Decker's new ¼" Utility Drill.

After buffing. Front photo shows mirror finish attained.

How Doehler-Jarvis helps Black & Decker's "do-it-yourself" family make merchandising history

Doehler-Jarvis die casts power tool that buff to a mirror finish in

Millions of "do-it-yourselfers" got their start with a Black and Decker power tool.

What makes people reach for a B & D tool? ...not only men, but women, too?

B & D says, "Good looks, good design, good quality, good price!"

Doehler-Jarvis die castings help Black and Decker achieve all four.

That eye-catching finish, for example. It's not chrome. It's "as-cast" aluminum, buffed to mirror brightness in *one* operation. No pre-grinding. No roughening. No grease wheeling. Not even a final buffing after assembly.

What's the secret of this quality finish?

Some people just point to a raw Doehler-Jarvis casting. "Look at that 'Hardware' surface," they say. "Not a dent. Not a blemish. Not a flow mark. It's even hard to tell where parting line and flash have been removed."

And certainly Doehler-Jarvis does give Black and Decker a casting they can work with. But you should see Black and Decker's buffing set-up. It's fully automatic, fully controlled. Air conditioned, without a speck of dust. Few concerns go as far as B & D to insure high quality buffing.

Reality lies somewhere in between

Achievements like this are to be expected

housings one operation

when a closely knit relationship develops between engineers of two companies over many years of product development.

Hardly a Black and Decker tool has not benefited in one way or another from this fruitful relationship. From it has come lighter weight, higher precision, increased strength, simplified and lower cost production, many performance improvements. And Black and Decker takes full advantage of the flexibility of die castings to provide extra sales features and aid economy.

Maybe, this is the time for you to do as companies like Black and Decker, Singer, AMF, Underwood, York, and many another have done...time to initiate a profitable business and engineering relationship based on the use of Doehler-Jarvis die castings.

Doehler-Jarvis Division

of

National Lead Company

General Offices: Toledo 1, Ohio

For more information circle No. 28 on the Reader Service Card

"Where cams or gears bear against steel, beryllium copper investment castings are used."

FARE IS FAIR (continued)

front face line up exactly with the counters mounted against a rib on the inner die casting.

One of the especially interesting functional die castings used inside the Viking meter is the pillow block, Figure 4a, which carries a worm gear arrangement. Powdered bronze bushings are cast as inserts at each end of the worm gear opening, supported on two cores from opposite sides of the die, and yet *the bushings line up so accurately that it is not necessary to line ream for the worm gear shaft.*

A number of small power transmission elements are also die cast in zinc, where the physical properties of this metal are adequate. A group of these ratchets, cams and links are also presented in Figure 4. Lower cost is the reason for die casting these as, for example, a 20-tooth ratchet including also a hollow shank with cored hole. Drilling a tiny taper pin hole and drilling and tapping a set screw hole are the only operations on this piece.

Investment Castings . . . Strength and Durability

Properties of beryllium copper, especially with regard to wearing qualities and dimensional stability over a long service life, account for the use of this alloy for a number of important investment cast parts of the Viking taximeter. While some steel castings are also used, the wear of steel against steel where cams or gears must bear against a steel pin or shaft has resulted in specification of durable beryllium copper. Berylco 20C is the alloy used for five of the six investment castings illustrated in Figures 5 and 6.

Pivotal unit on which the entire sequence of metering operations is initiated when the cab driver pulls down the flag, is the flag indexing cam, Figure 5a. A highly complex shape combining lobes, teeth, ratchets, cams, a square tapered hole and a disengaging stop, this piece is investment cast in beryllium copper. The advantage of the investment casting process is exemplified in the square, tapered socket for the flag, which would be difficult or impossible to machine . . . yet it is *cast to a size of .308 + .005 − .000 square with a .010 taper per side.* Some of the stepped surfaces must be faced to establish tolerances too close to be cast, such as + .002 − .000 on the length of the shank, but these are light, rapid and inexpensive machining operations.

The difficulty in casting steel in this irregular shape, and the unsuitability of brass to withstand the pounding, ruled in favor of the beryllium alloy.

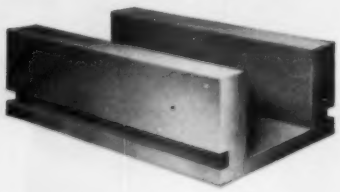
The return lever cam, Figure 5b, which meshes with the flag indexing cam and forms part of the initial gear train, is also investment cast in alloy 20C. Used to upset the dollar and cents scale, this cam is under very high spring tension at all times and nothing but a hardened material could withstand this duty. *With heat treating, this casting achieves a hardness of Rockwell C38-42.*

Continued on page 79

DIE CASTERS! DIE MAKERS!

SAVE on Die Construction Time!

With D-M-E Standard **EJECTOR HOUSINGS!**



GROUND FLAT, PARALLEL and SQUARE . . .
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Your Die Cast Die!

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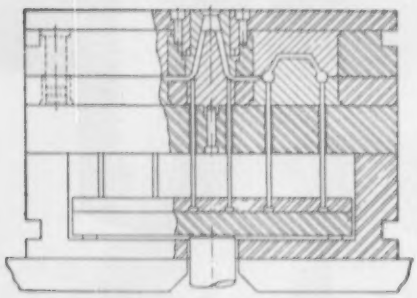
Using D-M-E Standard Components



D-M-E Standard Ejector Housings are ideal for use in die casting machines having hydraulic ejection, as shown in the illustration.

The 17 different standard sizes, corresponding to D-M-E's Standard Cavity Retainer Sets, give you a wide dimensional range to suit your die casting needs.

You'll find that they can save you valuable time and money on your next die cast die . . . So, START SAVING NOW!

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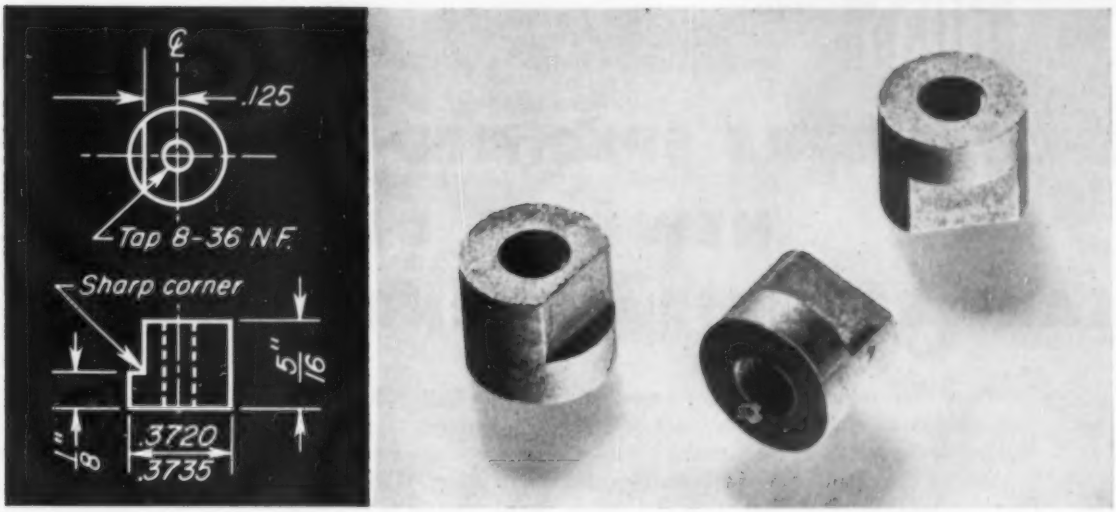

FOR PRECISION SEATING the inside angle of the molded offset must have practically zero radius.

Need an angle without a radius?

This company uses powder metallurgy to . . .

Get Those Sharp Corners Without Machining

IN order to adjust the knives of a power wood jointer properly, some provision must be made to raise and/or lower each end of each knife independently; thus, for each machine, from six to eight individual adjusting mechanisms are required.

The requirements for the adjusting mechanism are rigid. It must be physically small since, of necessity any device requires that holes be made in the head and if too large, the diameter of the head would have to be increased still further. Further, the leveling device must be positive in action and may not slip. It should be easily set and, of course, as inexpensive as possible to manufacture.

The leveling device used by the Boice Crane Co. fulfills all of the above requirements. It consists of a small cylinder on which a step is formed. A threaded hole through the cylinder operates on a jack screw so that as the screw is turned the cylinder is raised or lowered. One of these units is positioned near each end of each knife which rests on the formed step.

While this part, the knife raising plug, appears to be quite simple, it could not be economically made were it not for powder metallurgy. Probably the strictest requirement of this plug is that there shall be a sharp corner on the step as indicated in the drawing. The knives are, of course, surface ground on all faces and edges; if an appreciable radius exists on the step, practically all of the bearing surface will be lost. Further, there will be a tendency for the edge of the blade, where it contacts the fillet, to be thrown forward, thus changing the angle and the support of the knife. Were this step to be milled in a piece of bar stock, it would not be possible to secure the sharp corner required and a second undercutting operation would be required.

To machine this part by conventional methods would also present a serious holding problem. Gang milling would have to be done if costs were to be held down and the possibility of slippage so that non-uniform pieces are cut would be great. Probably rejects from such an operation would be high.

Any machining operation such as those required on this plug would, of course, generate some burrs. A finishing operation would then become necessary to deburr. Barrel tumbling, or an improper filing or buffing operation, would destroy the sharp corners which are desirable.

Continued on page 64

EXCHANGERS SPECIFIED FOR ENTIRE NEW LINE OF LAKE ERIE DIE CASTING MACHINES

Termed "expandable", Lake Erie's new Series D Die Casters have been introduced as simplified machines to which special features can be added as needed. *Only essentials for normal production are included.*

One of these *essentials* is a Ross Type BCF Exchanger. Hydraulic oil temperatures won't get out of hand to cause pump slippage here!

"In our effort to build an economical machine with rugged characteristics and top quality, it was only natural that we selected Ross oil coolers as part of the basic equipment," says Lake Erie Engineering Corporation.

Specifications for numerous types and makes of hydraulic machines regularly call for Ross Exchangers. In this way, top-rated thermal efficiency and ruggedness are both assured without costly "specials" in either engineering or fabrication.

Pre-engineered and fully standardized, Ross Type BCF Exchangers are assembled from mass-produced parts and stocked in a wide range of sizes to meet most needs.

For detailed information, request Bulletin 1.1K5.

ROSS HEAT EXCHANGER DIVISION
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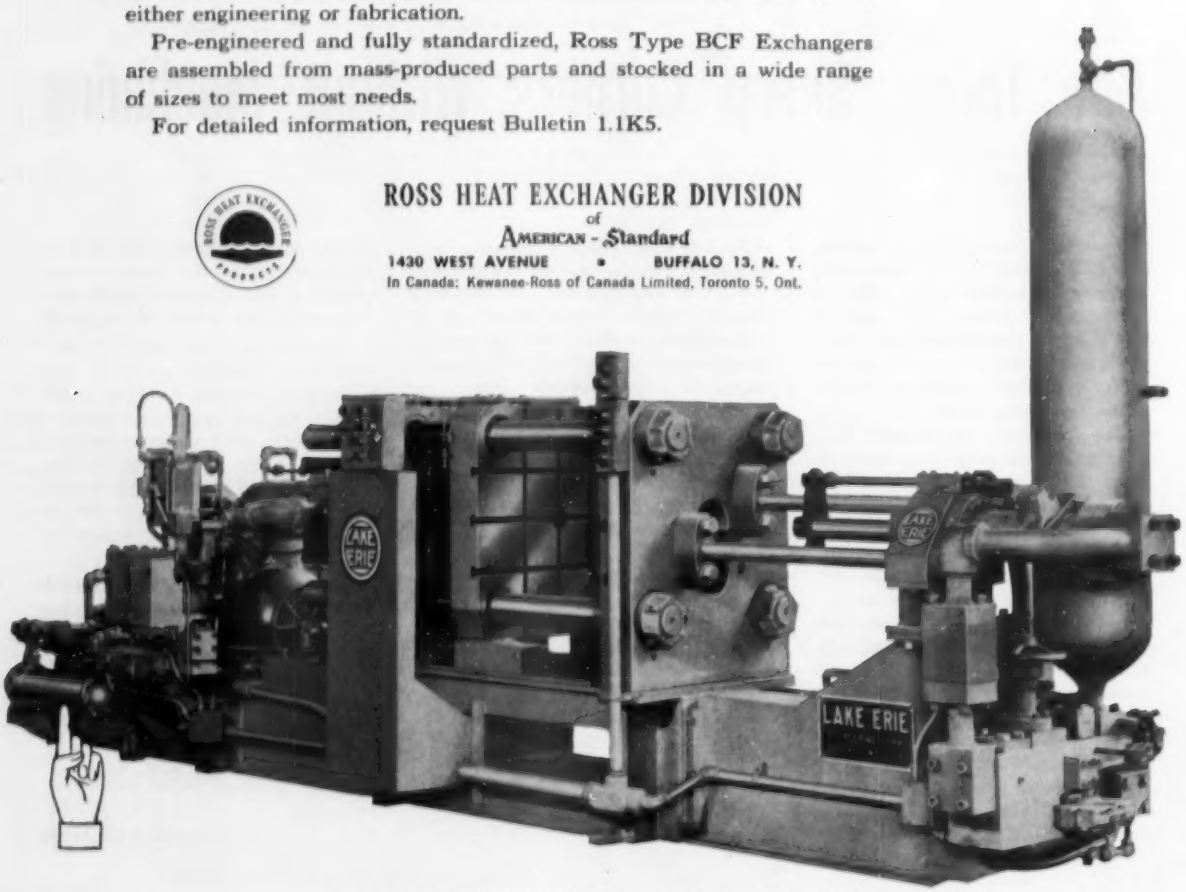

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TABLE 2

The major phases in setting up production that meets quality control are listed here

Production of suitable pattern cavity
Proper gating of casting
Mold preheat temperature
Metal pouring temperature

Quality Control Of Investment Castings (Part Two)

By CHARLES YAKER, Plant Manager
Misco Precision Casting Company

IN order to satisfy all of the control requirements in production as outlined in Part 1, the foundry must first develop the tools and processing techniques for any particular part. The major phases in this development before production are shown in Table 2.

The first phase is the production of a suitable pattern cavity. This cavity may be produced from a master pattern and soft metal die or it may be a machined mold. Into the tooling design must be incorporated the shrinkage characteristics of the pattern materials, the expansion characteristics of the investment mold, and the shrinkage characteristics of the metal.

Because of the inherent variations in producing the cavity, the foundry must determine, before producing quantities of parts, if the tooling is dimensionally accurate. The only satisfactory method of checking the dimensional correctness of the tooling is the production of sample castings. The purchaser should require that the foundry submit these sample castings for approval. This approval should be necessary to release the castings for production.

To produce the first samples, the investment caster draws on his experience and uses the gating, the mold preheat temperature, and the pouring temperature which he feels are best suited. The castings produced under these conditions do not always result in a part of satisfactory metallurgical quality. However, in order to expedite the progress towards production of large quantities, the foundry will often submit these first castings to obtain dimensional approval on its tooling.

At least two sample castings should be checked by the buyer to the blueprint agreed upon in the original purchase negotiations, and if the castings meet all the requirements of the blueprint, the customer may approve the sample even though all quality requirements have not been met. In doing so, the customer places his stamp of approval on the particular tools produced by the foundry. Where a machined mold is used, the approval applies only to this particular mold. If another machined mold is produced by the foundry, the purchaser should require a new dimensional approval which can only be obtained by submitting new samples made from patterns produced from the new mold.

Mr. Yaker's paper, delivered as part of a program by the Investment Casting Institute before the Sandia Corp., central research and development agency of the AEC, is being presented in three installments in PMM. Mr. Yaker covers the basic points of agreement between buyer and producer of investment castings.

If a master pattern was used to produce a soft metal die, the customer, in approving the samples, is approving both the master pattern and the soft metal die. If a new soft metal die is produced from the approved master pattern, the purchaser may require new layout samples, although some purchasers waive the necessity for new samples. The investment foundry is not, however, relieved from its obligation to produce dimensionally accurate castings.

After obtaining the approval of the dimensions, the foundry has several options.

1. If no further samples are required to obtain approval on metallurgical and physical quality, the foundry may proceed with the production of the parts. Before doing so, the proper gating, mold preheat temperature, and metal-pouring temperature must be established to produce castings which meet the customer's requirements (if these were not established in producing the first samples). In addition to these major processing variables, the foundry must also develop the necessary cleaning and finishing operations to produce a satisfactory part.

2. In some cases the investment-casting foundry will not have the assurance that it is meeting all the customer's requirements satisfactorily until the first production lots have been

Continued next page

processed by the customer. When the foundry is familiar with the customer's requirements for a particular part on the basis of previous experience, this procedure generally proves to be satisfactory.

However, the latter procedure may be disadvantageous from several standpoints. First, approval of a casting by a layout check against the blueprint does not necessarily mean that the casting will meet all the machining requirements of the customer. Many times accumulated tolerances along a casting may result in a shift of machining surfaces. The shift can actually result in insufficient stock for cleanup in machining, even though the casting may be within the limits of the blueprint.

Second, there is often an honest difference of opinion in interpretation of inspection standards between the foundry and the customer. These differences should, obviously, be resolved before going into full production on a part.

To avoid these pitfalls, in the case of a new customer or a new part, where neither the foundry nor the customer can rely on previous experience, the purchaser should require a second set of samples. This sample, the size of which is generally larger than that of the preliminary layout sample, would be used to determine whether the casting meets all the purchase requirements.

For this type of sample the foundry should be required to submit a minimum of 30 castings produced under the conditions which will be used in the ultimate production of the part and representative of ultimate production in every way. These castings should meet all the requirements of the customer—the visual standard, the radiographic standard, the fluorescent penetrant standard, the metallurgical requirements, and all dimensional requirements.

What To Look For On Production Samples

The production samples should be fully inspected by the customer for all visual and quality requirements. The customer should then X-ray these castings or review X-ray films submitted by the foundry. In addition, the castings should be gauged on production gauges and fully machined. From the results of this sample lot, the customer and foundry should determine the following items:

1. Are all dimensional requirements met? If not, the necessary deviations such as increased tolerances, additional stock for cleanup, etc., should be agreed upon.
2. Do the castings meet the metallurgical and visual standards required? Generally, the X-ray, fluorescent penetrant, or visual standards should not be compromised. However, a need often exists for understanding between the foundry and the customer in interpretation of these standards.

Test coupons may be cut from the castings to determine that material specification properties are met by the casting. For some applications of a highly critical nature such as turbine blading, the castings may actually be service-tested before the foundry

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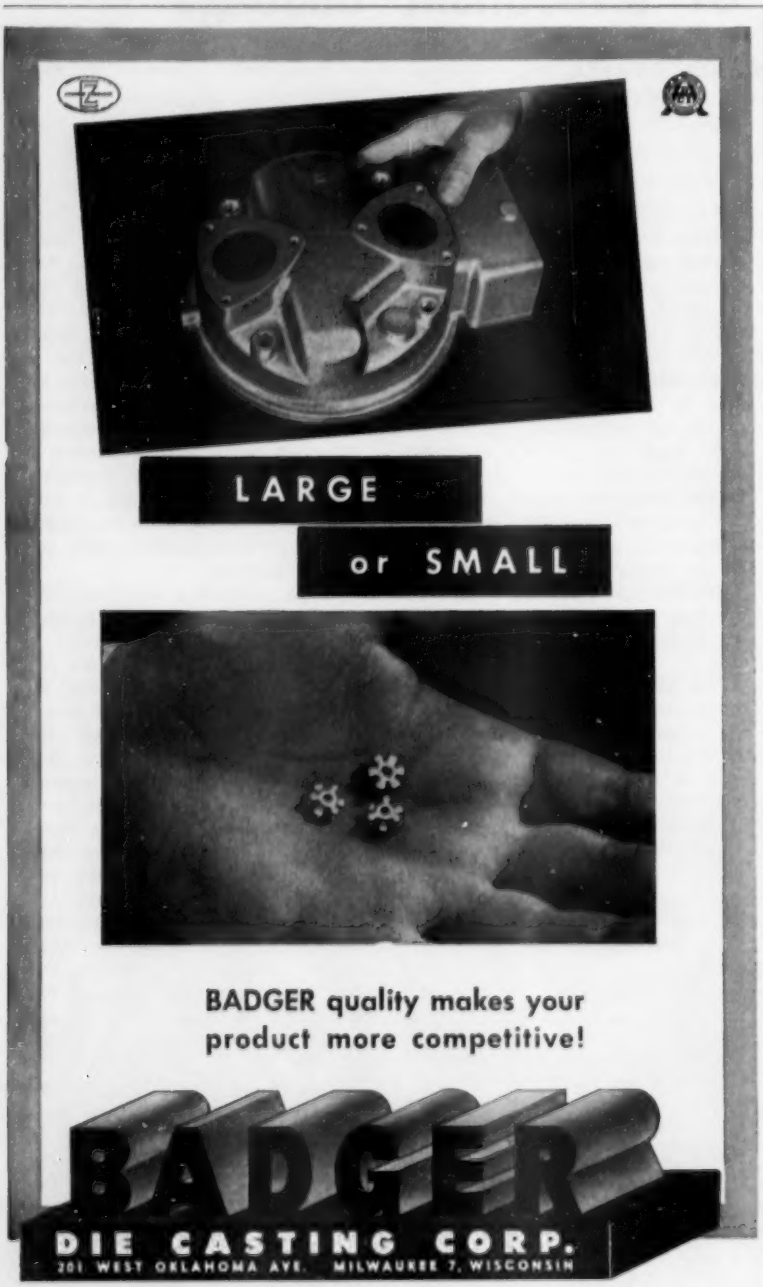

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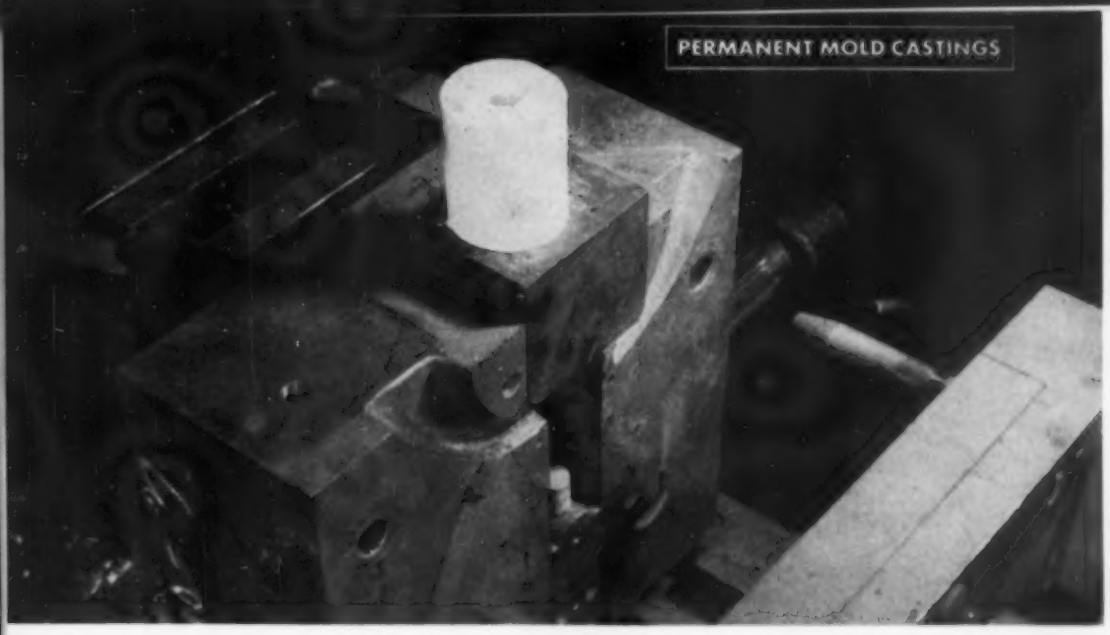

1. INSULATING RISER sleeve (white) is shown positioned in the insert block.

2. TAP CHANGER with riser produced using ½ inch ID insulating riser sleeve. For purposes of comparison, a standard riser is located at the left of the tap changer. Note that the form of the standard riser is such as to promote rapid freezing at base of the riser, cutting off supply of metal to casting.

Insulated Risers For Permanent Mold Casting

By D. PECKNER
Materials Engineering Department
Westinghouse Electric Corporation

THE problem of completely filling a mold cavity is an old one. Producing castings in metal molds, as is done in the permanent molding process, exaggerates this problem because the rapid rate of heat transfer between the molten metal in the riser and the mass of the mold tends to quickly freeze the supply of metal present in the riser. The loss of this reservoir of metal increases the problem of overcoming shrinkage porosity. It was felt that if some method could be employed to slow down the rate of heat transfer between the cast alloy and the mold, a substantial improvement in metal soundness would be obtained.

Insulating riser sleeves, which are used in many sand foundries, seemed to present a solution to this problem. Figure 1 shows an insulating riser sleeve (white tube) positioned in an insert block over a mold cavity. The sleeves are made from a gypsum-base material and aid in producing a sound casting by maintaining a positive metal feed for a considerably longer period of time than do standard risers. The insert block was used because it was not considered desirable to

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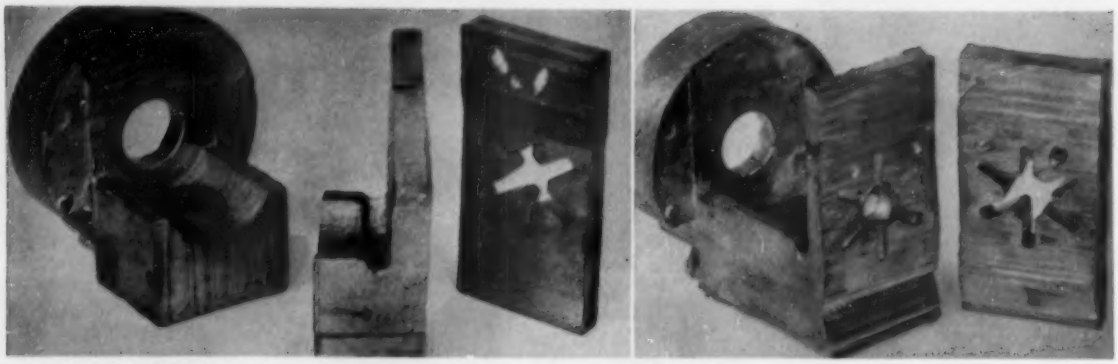
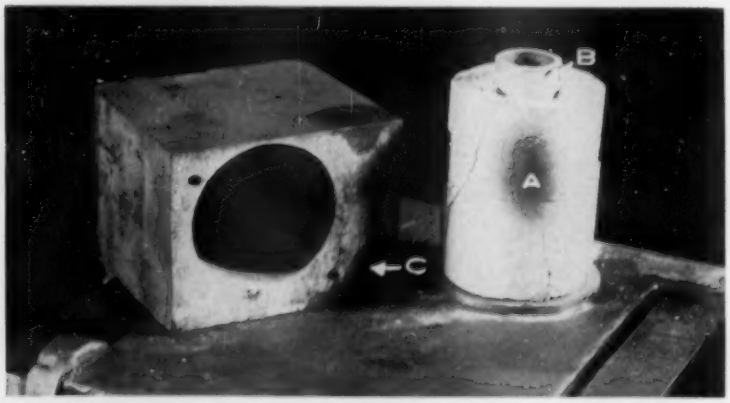


3. COMPARISON between tap changers produced with a standard riser, left, and insulating riser sleeve, right. Note the void above the star shaped hole on the casting at the left.



4. VIEW OF INSULATED RISER shows refractory (A), placed around the riser insert (B), which is then inserted in insert block (C). A cover, not shown, is placed on top of the insert block to prevent loss of refractory.

5. IN CASTINGS produced with an insulated riser, voids on the side of the casting are close to the star-shaped hole where they will not interfere with machining. Shrinkage porosity exists directly under the riser but is not extensive.

radically alter a current production mold.

The transformer tap changer is an excellent example of the type of casting where an insulating riser sleeve might be used. The size of the riser is extremely large and yet defective castings were being produced. Figure 2 shows a tap changer produced using an insulating riser sleeve, with a standard riser standing beside it. Note that the standard riser is shaped roughly in the form of a truncated cone. Although there is a great deal of hot metal in the riser, this form will tend to freeze at the base, thus choking off the supply of metal to the casting.

Castings poured with the insulating riser sleeve in place of a conventional riser were produced without any difficulty. Each time a casting was poured, however, the insert block had to be placed in the mold and the riser sleeve inserted in the block. Prior to opening the mold after casting, the riser sleeve and insert block had to be removed individually in order to allow the casting to be ejected from the mold. Castings were poured in the normal manner, using both ½ inch and ¾ inch I. D. insulating riser sleeves and the following points were checked:

1. Time required for riser to solidify,
2. Quality of casting,
3. Number of pieces produced per sleeve.

A distinct reduction in the number and size of voids was found when castings produced using an insulating riser sleeve were compared with those produced using a standard riser. There are no voids in the top sections of the castings made with an insulating riser sleeve. There is a rather extensive void in the casting produced with a regular riser. The void occurred in an area almost directly under the riser and it may be assumed that metal in the insulating riser sleeve, solidifying more slowly than usual, fed the casting and allowed the air entrapped in the casting to pass through the still

Continued on page 95

DIE CASTINGS

ARE BRASS OR BRONZE really needed for sea-going fittings? This company has been successful in using chromium-plated . . .

Zinc Die Castings For Marine Hardware

BY MARVIN PERKINS
Perkins Marine Lamp & Hardware Corp.

ONLY THREADING and tapping are needed before chrome-plating these two die castings.

HISTORICALLY, marine hardware has been either brass or bronze; preferably bronze. This dependance on a copper base alloy for exposure to salt water and salt spray has been carried to the extent of the development of several bronzes specifically for marine usage.

As might be expected, almost a superstition has grown up over the years that no other metal or alloy has the required combination of strength and corrosion resistance. It is, therefore, quite impressive to find plated zinc base die castings serving very effectively where they are exposed to salt water spray and where a not inconsiderable mechanical stress exists. In this combination of conditions, where the possibility of stress corrosion cracking certainly exists, the application is exceptional.

The particular part is a holder for a marine flag staff, shown above as a semi-finished casting made by the Allen-Stevens Corp. The holder is a two piece unit—the holder proper and a locking ring. Formerly these parts were brass: the holder a die forging and the ring a screw machine part. Obviously such parts required overall machining, threads had to be cut and the mounting holes drilled and counterbored.

Now, as a zinc base die casting, the holder is cast ready for surface finishing after the thread to receive the locking nut is cut. The mounting holes, with their counterbores, are cored and where formerly the shaft hole had to be reamed to size it is now cast within close enough tolerances so that only vestigial flash needs to be removed in the trimming operation. The locking nut is also a zinc die casting and requires only an inexpensive tapping operation.

Cost-wise, the advantage lies entirely with the die cast parts. This is due, of course, to the savings that are realized by reducing the machining of the forging and the manufacture of the nut from bar stock. By the time the complete unit is finished and ready for installation, there is sufficient reduction in manufacturing costs so that the locking nut is essentially free; that is, the costs were reduced by the amount that was formerly spent to make and surface finish this nut.

Experience thus far with this chromium plated zinc die casting indicates that for many other marine applications within the strength range of the die cast part, it should be possible to substitute these castings for many components that are now brass forgings or castings . . . and at appreciable saving.

Stress corrosion cracking which has sometimes been considered a deterrant to the use of these die castings is apparently of no consequence at, or below, atmospheric temperatures.

Surface finishing costs are generally less for a zinc die casting than a brass part where both are chromium plated because of the elimination of grinding and polishing operations. Further, a chromium plated die casting represents a materially lower maintenance problem than does polished brass, so long a favorite.

This alloy list keeps getting longer and longer!

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SAE 4130
SAE 52100
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AMS 5385B
AMS 5388
PWA 651
ARMCO 17-4-PH
4750
AISI 300 SERIES
AISI 400 SERIES
*MONEL
*INCONEL
ACI-H7
18-4-1
IIB2
IID2
INVAR
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A *long* alloy list is an excellent indication of long alloy experience! As source for many of the nation's major investment casting suppliers and others, Cannon-Muskegon furnishes a great variety of alloys for remelt or reprocessing. Alloys include super stainless and tool steels, as well as nickel and cobalt-base alloys. Other alloys are prepared specially for medical, aeronautical, electronic, industrial and experimental uses.

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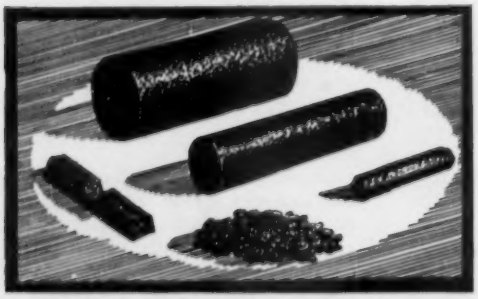

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FORT DIE CASTING CHANGES OWNERSHIP

The Fort Die Casting Corp. in Marysville, Mich. has recently been purchased by a new corporate group and will be operated by the same management that now manages Centr-O-Cast and Engineering Corp. and Process Machinery Manufacturing Co.

Fort Die Casting Corp. has been doing business nationally for 27 years. Its main production has been zinc die castings, raw or plated. The company has its own plating facilities. It also manufactures aluminum die castings and lead die castings.

The Centr-O-Cast and Engineering Corp. produces permanent mold and centrifugal castings of aluminum. Current output is approximately 10 million pounds of aluminum castings per year. The main plant is in Detroit. The Process Machinery Manufacturing Co. manufactures centrifugal casting machines and tools and molds for both permanent mold and centrifugal casting processes.

MAGNESIUM AZ91B ALLOY PRICE INCREASED

A price increase of 1-½ cents a pound for magnesium AZ91B alloy die casting ingot was announced today by The Dow Chemical Company.

The increase, effective Jan. 3, brings the price to 31 cents a pound in Zone 1 and 32-½ cents in Zone 2.

The prices are base prices applicable to orders of 10,000 pounds or more. Transportation allowances will be continued.

A spokesman for the Dow Magnesium Department said the increase was due to higher prices for scrap magnesium.

A. F. BAUER PROMOTED

Alfred F. Bauer has been appointed assistant general manager of the Doehler-Jarvis Division of National Lead Company, it has been announced. Formerly chief engineer of the Doehler-Jarvis Division, Mr. Bauer will continue in that capacity.

Mr. Bauer was born and educated in Germany. He managed the die casting facilities of the Mahle Organization in that country before coming to the United States in 1947. He joined the Dow Chemical Company in 1948 and in 1949 was made manager of the Dow die casting department. In 1951 Mr. Bauer came to Doehler-Jarvis.

SEVERAL new product engineering standards, in addition to those published during 1955 in PMM, have been released by the American Die Casting Institute. These standards, developed by ADCI to help product designers get the most for their money from the die casting process, will be published in PMM . . . starting below with the standard covering depth of cored holes. Complete set of standards is yours for the asking. The editors of PMM will be glad to forward your request to the Institute.

More Design Standards

PRODUCT STANDARDS FOR DIE CASTINGS

ADCI-E6-55T
DEPTH OF CORED HOLES

NOTE—The values shown herein represent normal production practice at the most economic level. Greater accuracy involving extra close work or care in production should be specified only when and where necessary since additional cost may be involved.

CORED HOLES

Optimum greatest depth of cored holes as related to diameter is shown in the table. The values shown for hole depths are subject to the draft requirements shown in ADCI Product Standard E7.

Requirements for tapped holes are shown in ADCI Product Standard E8.

ALLOY	DIAMETER OF HOLE — INCHES								
	1/8	5/32	3/16	1/4	3/8	1/2	5/8	3/4	1
	MAXIMUM DEPTH — INCHES								
Zinc*,	3/8	9/16	3/4	1	1 1/2	2	3 1/8	4 1/2	6
Aluminum*	5/16	1/2	5/8	1	1 1/2	2	3 1/8	4 1/2	6
Magnesium*	5/16	1/2	5/8	1	1 1/2	2	3 1/8	4 1/2	6
Copper				1/2	1	1 1/4	2	3 1/2	5

*For cores larger than 1" in diameter the diameter-depth shall be 1:6.

NOTE — The depths shown are not applicable under conditions where small diameter cores are widely spaced and, by design, are subject to full shrinkage stress.

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TWO ALLOYS
continued from page 41

net and hand wheel for both of these valves as well as for some other styles not illustrated. Because of this constant design factor it becomes economical, from a tool amortization standpoint, to use die castings in zinc alloy.

2. *Individual orders.* For the same reasons as noted under tool amortization, the individual orders for castings of bonnets and hand wheels can be large enough to hold the set-up charges per casting at a tolerable level.

3. *Machining savings.* As the castings are being produced by Parker White-Metal Co. very little machining needs to be done. The bonnet needs only to be threaded and faced while the hand wheel requires a clean up cut in the center hole, one chamfer cut (These two operations are done simultaneously.) and a hole drilled for the cross pin. All operations on these two castings are very simple and inexpensive. Were these castings sand cast, for example, over-all machining would be required.

4. *Surface finishing.* All castings on these units are spray painted with aluminum paint. It is probable that there is no saving on surface finishing.

5. *Reduced scrap.* Air pressure delivered to the spray gun varies from 50 psi to 70 psi. At these pressures appreciable leakage can occur in sand cast bonnets since they must have rather thin walls and blow holes could leave either holes or weak spots that would later fail in service.

A zinc die casting is adequately dense and is free of inclusions so this trouble does not occur. Further, with a sand casting, over-all machining can disclose imperfections which would cause rejection even though they might not cause failure.

On these bonnets and hand wheels the use of zinc base die castings becomes the most economical method of production.

When the three die castings being used on the spray gun, Figure 2, are considered the same advantages of an aluminum base die casting become evident. Aluminum was chosen because of its light weight and superior mechanical and physical properties. Quantities in total and individual orders are great enough to hold costs down and machining is reduced to a few very inexpensive and simple operations. Scrap losses are probably no lower with die castings than sand castings if machining errors are not considered. This same applies to surface finishing since a polished aluminum surface is used.

In the case of the aluminum cup cover, however, another advantage of the die casting process becomes evident. The inner side of the cap carries threads to lock the cap onto the cup. The most desirable design is one that would be impossible to machine except by very costly and time consuming methods. If this part were cast by any other method other than die casting, some finish machining would be essential, making final costs excessive. As die cast by the Aluminum Co. of America no finish machining is required.

Considerations such as those given above make it apparent why, for the particular parts discussed, die casting is the most economical production method.

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DESIGNERS: Here are properties obtained from

Nickel Bronze Powdered Metal Parts

By STANLEY P. PERRY
Consulting Metallurgist

TABLE 1. Mechanical properties of 7.5% nickel, 8% tin, 84.5% copper sintering; Pressed at 20 TSI.

Sintering			Properties		
Temp °F	Time-Hrs	Atmos.*	Tensile Str psi	Elongation % in 1 in.	Hardness Rockw R30T
1400	2	NH_3	30,000	.5	25
1450	2	NH_3	32,000	1.0	30
1500	1	NH_3	37,100	1.5	35
1550	1	NH_3	40,700	1.5	43
1640	2	NH_3	52,000	2.5	50

TABLE 2. Mechanical properties of 15% nickel, 4% tin, 81% copper sintering; Pressed at 30 TSI.

Sintering			Properties		
Temp °F	Time-Hrs	Atmos.*	Tensile Str Psi	Elongation % in 1 in.	Hardness Rockw R30T
1650	2	NH_3	37,300	5	35
1700	3	NH_3	42,400	4	43
1800	3	NH_3	61,000	2	66

*Dissociated

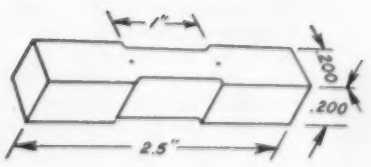

FIGURE 1
Tensile test bar selected because of its similarity in size to the diamond-bearing segments brazed to steel cores to be used as saws for ceramic materials.

A COMMON powdered metal alloy used in the diamond abrasive industry is a simple bronze consisting of 90 percent copper and 10 percent tin. This alloy is made of elemental powders and has, on the average, a tensile strength of 25,000 psi. and an elongation of 7 percent in one inch.

The following experiments were made in an effort to find stronger alloys with a copper matrix. Nickel was introduced, since it performs admirably as an alloying ingredient, sintering readily in a dissociated ammonia atmosphere. After a number of combinations, two alloys were developed.

The first alloy, having stronger properties, Table I, consists of 7.5 percent nickel, 8 percent tin and 84.5 percent copper. After a number of tries, it was discovered that 20 tons per square inch was the optimum compacting pressure. The compact has good green strength and can be readily handled.

From an analysis of Table 1, it can be seen that the tensile strength increases proportionately with the sintering temperature. After about 1650 F, too much fusion occurs, properties decrease, and therefore, under the conditions present, 1640 F is taken as the optimum temperature for the best tensile, elongation, and hardness. The ductility is 2.5 percent at this point and is quite acceptable, as the coupon can be bent from straightness to a 7 inch radius.

The powders used were "U" type copper from Charles Hardy, Inc., carbonyl nickel from International Nickel Co., and tin from Metal Disintegrating Co.

Continued next page

The powders were mixed for three hours by tumbling.

The type of tensile coupon, Figure 1, was chosen because it is almost the same size as the diamond bearing segments which are brazed onto steel cores and used as saws for ceramic materials.

The second alloy contains 15 percent nickel, 4 percent tin, and 81 percent copper. Because there is now more of a higher melting metal, nickel, in the composition a higher sintering temperature is required. Secondly, since nickel requires a higher molding pressure than copper, 30 tons per square inch was found to be the suitable pressure. Examination of Table 2 shows again that the tensile strength increases with increasing temperature, as does the hardness. The ductility decreases slightly, the higher temperature producing a more brittle phase.

Thus it is evident that by the decrease of tin and the addition of nickel ternary alloys of copper can be produced which have double the strength of a simple 90 percent copper, 10 percent tin bronze. These nickel bronzes being non-magnetic and possessing fine mechanical properties, can lend themselves to many uses. No doubt many different combinations of these three metal powders can be blended to produce fine alloys.

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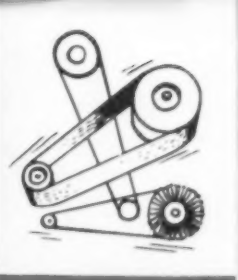
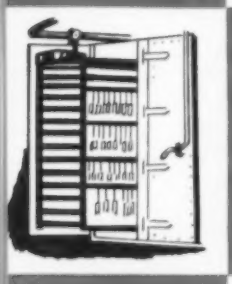
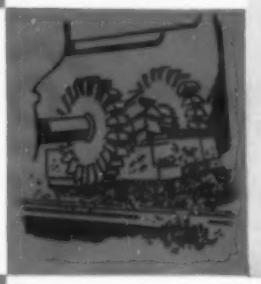
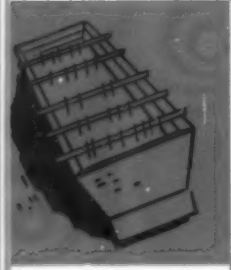
SHARP CORNERS
continued from page 53

As the plugs are now made by powder metallurgical techniques, the dimensional tolerances and sizes are held, the step has no appreciable radius, no burrs are generated, no jigs or fixtures are required. The parts are delivered by the vendor, the Michigan Powder Metal Products Co., complete and ready for assembly at an estimated cost that is less than 1/3 the cost of a machined part.

In the above discussion, one factor of prime importance has been omitted, largely because it is difficult to assess costs, that is inspection. Since machining the parts would require at least three distinct steps — screw machine, milling and deburring — at least that number of inspections would be required. With the parts fabricated from iron powder, the only inspection required in the purchaser's plant is a final one when the parts are received. In practice, it has been found that the uniformity from part to part is so good that all inspections have been eliminated and the plugs go directly into assembly.

One other factor should be brought out concerning these powdered metal parts. When first samples were made, they failed in shear at the step. This fault was easily overcome by hardening the parts. No hardness data are available, but since the part is an iron copper alloy it is, of course, susceptible to age hardening or to case carburizing and hardening, which ever is the better.



PMM

Finishing Section

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Putting A Glow On Zenith TV Bezels

a PMM photo story

ROMAN GOLD and satin silver, obtained by a combination of organic coatings, is the finish selected by the Zenith Radio Corporation to frame the picture tube on their new 21-inch television sets. The bezel, die cast in zinc for reasons of superior rigidity, improved assembling and simpler field servicing, goes through an extensive finishing cycle at the Grand Rapids Brass Company, which produces the die castings and furnishes them to Zenith completely finished.

Because of the high quality finish specified by Zenith, and the interesting combination of lustrous gold and satin silver, a photographic tour of the finishing line at Grand Rapids Brass Co. is presented here.

TRIMMING flash from the OD and piercing the ID are accomplished in a heavy punch press. While the trim dies remove the bulk of excess metal, some manual touchup with belt sander and hand tools is still necessary.

BELT SANDER, extending up through the work table, has been improvised to clean up the ID. A continuous 4 x 48, 60 grit belt moving at a rate of approximately 500 surface feet per minute, cleans up burrs left by trimming.

MANUAL DEBURRING, including scraping and filing with hand tools, must be done after belt sanding. This includes work on holes too small to be processed with the sander. Inspection for cold shots, cracks, slug marks and pits is also done here.

PARTING LINE polishing and buffing with a Hammond lathe and Toro idler removes about .030 stock left by the trim die. A continuous belt, 3 x 132, 180 and 240 grit is used at 2300 rpm, with Buckingham polishing compound.

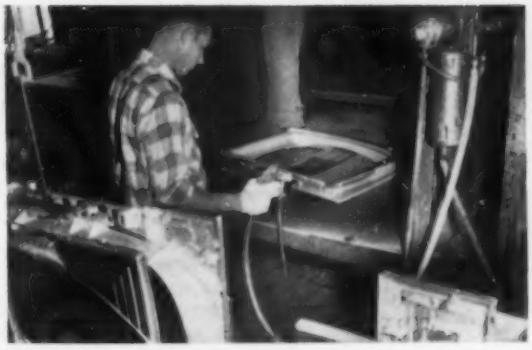
AUTOMATIC BUFFING of front faces follows hand buffing of any rough spots. Nest type holding fixtures carry the bezels under bias type buffs on Acme heads. Klaiber liquid compound is used, with the buffs at 1600 rpm.

DEGREASING and wiping removes buffing compound, as well as oil and other soil. Racked castings are dipped manually into the trichlorethylene degreasing tank. This is the only cleaning needed prior to painting.

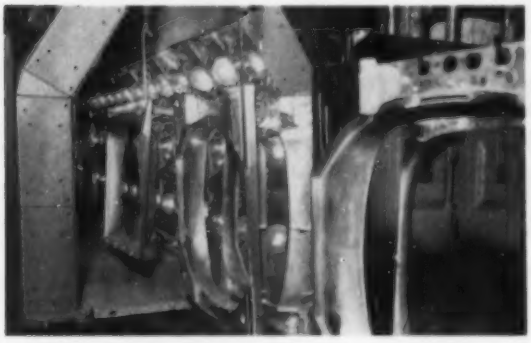
Here's how the two-tone

SATIN SILVER, using same basic enamel with bronze powder in place of analine dye, is sprayed using a book type mask. Powder addition and thinner must be adjusted to give proper low gloss and flotation of powder.

HIGHLIGHTING to remove overspray of satin silver from the Roman gold is the final step, after the bezels are sprayed. Cloths dampened with mineral spirits are used. After this, the final baking is given.



ROMAN GOLD synthetic enamel is sprayed manually, care being taken to apply a uniform deposit necessary to simulate gold appearance. Paint thickness of 3.4 mil is applied at room temperature, with paint viscosity 20 seconds in a #4 Ford cup.



BAKING with 500 watt infra red lamps is a speedy, conveyorized operation. Baking cycle for Roman gold is 6½ minutes with 192 lamps; for satin silver 11½ minutes with 360 lamps. Minimum temperature of 250 F must be held.

SILK SCREEN PRINTING of lettering on the lower panel of the bezel is a rapid, dependable method of imprinting. A special silk screen baking enamel, thinned with butyl lactate for adhesion, is used.

gold and silver finish is applied and baked

ZENITH TV (continued)

The two distinctly different appearances of shiny gold and matte silver are obtained with a single base formulation: the gold is produced by adding an imported alkaline dye, the silver by adding a bronze powder. The base material is a modified alkyd and melamine baking enamel which gives a hard, durable surface and good adhesion properties.

Every phase of the finishing is subjected to closest inspection, since the bezel on a TV set is a focal point of the styling and, therefore, surface flaws cannot be tolerated. A large part of the finishing is done manually, although for producing the high color on the front faces of the bezel, an automatic buffing machine has been developed.

After leaving the trim press, each bezel die casting goes through ten finishing operations. At the present time, three different bezels produced for Zenith are being given similar finishing treatment.

Choice of a die casting, rather than a stamping, for this large bezel, is dictated by design and production

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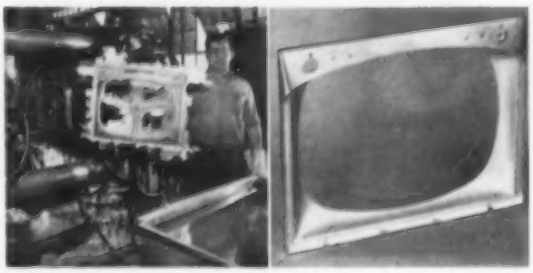
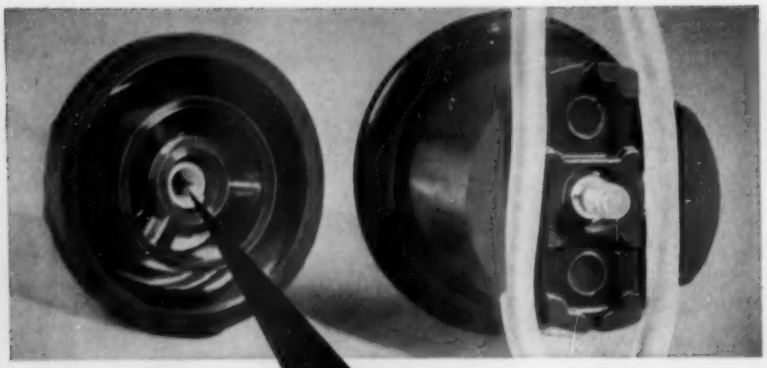


EVERY STEP from the die casting machine to the finished bezel ready for installation in your Zenith TV set, is aimed at accentuating and perfecting the smoothly modeled styling called for by the designers.



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considerations. In the first place, all mounting bosses can be cast as an integral part of the bezel, allowing the picture tube to be assembled to the bezel prior to insertion in the cabinet. This allows Zenith to test and adjust the set before final assembly . . . with accompanying cost savings.

This feature, made possible by the use of a die casting, also affords easier servicing of the set in the field, as the entire tube and chassis can be removed from the front of the set in one simple operation. Likewise, the glass in front of the tube can easily be removed for cleaning without removing the tube and chassis, as is necessary with other sets.

Close dimensional control and sharpness of styling detail are additional features of the die castings that Zenith finds advantageous.

THREE TECHNICAL MEN JOIN ANDERSON LABS

Three technical specialists, Dr. William Smith, E. D. Flickinger and Charles Neuroth, have joined Anderson Laboratories, Inc., of Weston, Mich. Dr. Smith has been assigned to a research project on high temperature fluids; Mr. Flickinger is in charge of production; and Mr. Neuroth is responsible for synthetic and preparation of specialty chemicals.

Dr. Smith was formerly associated with Carbide and Carbon Chemicals at South Charleston W. Va. He was graduated from Rensselaer Polytechnic Institute and received a M. S. degree in Chemical Engineering. He received a Ph.D. degree in organic chemistry from the University of Illinois. Mr. Flickinger was formerly associated with Wyandotte Chemical Co. He was graduated from the University of Oklahoma with a degree in chemical engineering.

Mr. Neuroth was graduated from Adrian College with a degree in chemistry. He has worked on the Manhattan Project and was associated with Parker Rust Proof.

BART LAB EXPANDS

The completion of a new plant to house the precision precious metals plating facilities of Bart Laboratories Co., Belleville, N. J., has been announced by Ray N. Griffin, vice president. Now encompassing approximately 19,000 square feet of floor space, the new plant is in North Newark.

Practical Pointers For Machining Titanium Alloys

AS titanium becomes more widely accepted as an engineering material, and the preliminary forming techniques are evolved, a set of secondary problems confronts the tool designer and engineer responsible for finishing titanium on the production line. Many plants where titanium has never been machined previously on a production line are now finding it necessary to tool up for it.

As a guide to those whose experience in machining titanium is limited, Rem-Cru Titanium, Inc., Midland, Pa., has outlined some recommended practices, based upon the rapidly increasing knowledge cumulatively gained in its own shops and by a wide range of industries now using titanium. Some of these practices, suggested by Rem-Cru as a "point of departure for the machining tests which precede production operation," are offered here.

General Practices

• *Physical characteristics* of titanium place it in a category of its own; avoid close comparison with any other metal since this would be valid only to a limited degree and might lead to erroneous conclusions.

• *Carbon solubility* is about .20 percent; above this figure hard carbides appear and reduce tool life, while alloys having between zero and .20 percent carbon have similar machining characteristics.

• *Tendency to seize* makes it necessary to take generous depths of cuts to prevent riding of tools on work and excessive tool wear.

• *Localized heating* due to low thermal conductivity is partially offset by the low thermal expansion of the material, but requires provision of adequate cooling for the tools.

• *Slow speeds and heavy cuts* are recommended practice.

• *Low modulus* means that small diameter bars must be backed up to prevent springing.

Single Point Turning

• *Rough turning* to remove highly abrasive scale from ingots and forgings is one of the most difficult machining problems. It is most important that the cut be sufficiently deep and that the tool be engaged in the work at all times; intermittent cutting will shorten tool life. Machines must be tight, well supported and of sufficient size to insure freedom from vibration and chatter.

• *Super high speed steel tools* operating with heavy feeds are usually used for rough machining titanium base alloy forgings, while carbide tools are used for machining titanium base alloy forgings. After scale removal, carbide tools may be used and speeds increased from 40-65 sfm to about 160 sfm for semi-finishing.

• *Finish machining* to an excellent finish is not difficult, and surface speeds of 200 to 350 sfm with carbide tools have been used. On lathe turning, the tool may be set slightly above center for best life. Finish cut should be made using a depth of cut of .010 to .020. In no case may negative rake angles be employed.

• *Sulfurized oils* are commonly used and are satisfactory cutting fluids, acting as an efficient lubricant and impeding build-up of the titanium chip on the tool. This galling or loading tendency may be minimized by keeping the tool cool by use of the efficient water base coolants. Where sulfurized oils may cause pitting of cobalt-bearing tools, such as cobalt-bonded carbides, the water soluble oils may be preferable. Cooling of tools with liquid carbon dioxide has also been successful.

Drilling

• *Drilling* is not difficult when positive feed is employed at all times and when the drill is not allowed to ride on the work. Slow speed and heavy feed are again advised, while a shorter drill solidly chucked provides the necessary rigidity.

• *Longer tool life* appears to be obtained with five percent cobalt high speed steel drills. Drills ground to 59° cutting angle (118° included angle) using lip clearance of 12 to 15° have proven satisfactory.

• *Drill speed* is generally 12 to 15 sfm; feeds vary somewhat, although a conservative .003 to .008 ipr is recommended. Higher rates of feed have also been noted.

Tapping and Reaming

• *Three-flute*, interrupted tooth, spiral point tap is satisfactory. Operating speed is 12-15 sfm.

• *Hand tapping* may be done using taps designed for autenitic stainless steels.

Continued next page

You can get this "package" on machining titanium at bargain prices . . .

The Office of Technical Services, U. S. Department of Commerce, has gathered 42 technical research reports on machining titanium into a "package" and offers it at a bargain price of $40, which is $7.25 less than the total price of individual reports.

Included are such topics as: Face-milling titanium, Tool-life tests on titanium alloys; Effect of feed, side-rake and side-cutting-edge angle on tool life; Drilling and tapping titanium; etc.

Also available is a 26-page listing of available reports on titanium. This is identified as CTR 306, sold for 50c. More recent papers are listed in the OTS regular publication, Government Research Reports.

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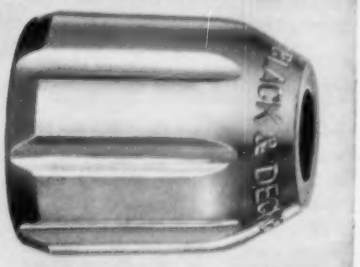

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• *Standard carbide reamers* have proven satisfactory in production at 100 to 200 sfm, but it is suggested that holes be reamed initially at 40 to 70 sfm. Feeds are between .800 to .020 ipr, increasing with the diameter. Better finish is obtained with spiral flutes.

Milling

• *Up-milling* of unmachined bars is recommended to avoid the wearing of cutters on the hardened surface.

• *High speed steel* mills, spiral or straight, and carbide-tipped cutters, give satisfactory life.

• *Positive rake angle* of 6° to 10° is suggested.

• *Evaluate the job* in advance so that speeds and feeds will provide a chip load of .003 to .005 per tooth at approximately 20 to 30 sfm for high speed steel and 65 sfm for carbide cutters.

KENNETH P. BELLINGER FORMS NEW COMPANY

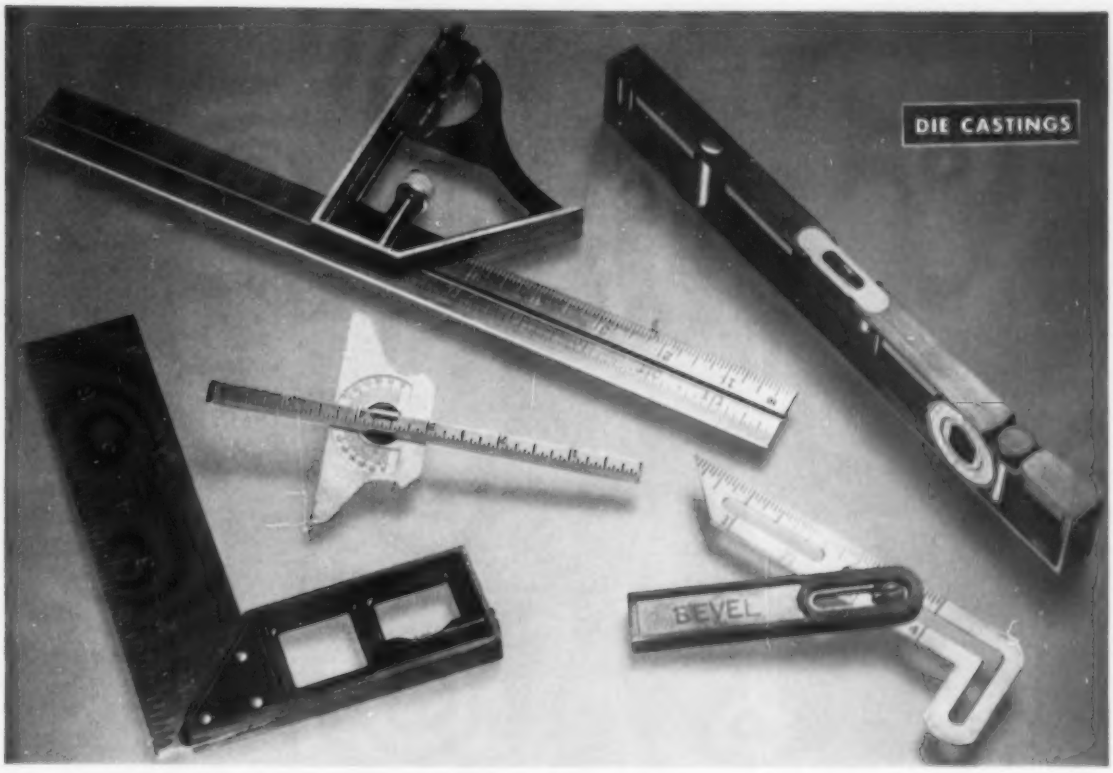
Kenneth P. Bellinger has recently resigned as executive vice president of the Chemical Corporation, Springfield, Mass., to form his own company, Conversion Chemical Corporation, Rockville, Conn. The new organization will specialize in specialty cleaners and treatments for the metal finishing industry. The company will also represent a number of well-known manufacturers in the metal finishing equipment field.

Mr. Bellinger was associated with the Chemical Corporation for 16 years as technical salesman, branch manager, technical director and general sales manager. A graduate of Rensselaer Polytechnic Institute with a chemical engineering degree, Mr. Bellinger has a background in the industry including original sales development work at Pennsylvania Salt Manufacturing Co.

H. W. FAINT DIES

Harold W. Faint, Chicago — Western states sales manager for Metal Finishing Division, Frederic B. Stevens, Inc., died suddenly from a heart attack December 22, 1955.

Prior to joining Stevens in 1953, Faint was sales manager, Industrial Filter and Pump Mfg. Company, Chicago, where he was employed seven years.



Dip Painting

Simple finishing method for die cast tools

By J. W. SALDINGER
Twix Mfg. Co.

A VERY definite place exists for a line of hand tools that have relatively high accuracy and yet fall into the moderate price class.

Such tools, suitable primarily for the home craftsman, if given moderate care, retain their exactness over a period of years.

To fill this essential market with tools that meet the above requirements, the Twix Mfg. Co. has developed a line of hand tools, above, that, wherever possible, utilize zinc die cast components.

Because the die casting process is inherently a highly accurate manufacturing method capable of producing large numbers of parts at very low costs and because finishing of die castings is very simple, its use in the manufacture of these tools is almost dictated. Since the various steps in the manufacture of the individual tools differ only in degree, only the combination square will be considered in any detail.

The head of the combination square comes to the finishing line as a rough trimmed casting shown. All residual flash is first removed using either hand or machine methods depending upon the location of the material to be removed. The casting, without any other surface treatment, then goes to the painting where it is given two dip coats of black enamel. After the second dip coat, the heads are baked at 375F for up to 30 minutes. This baking treatment varies somewhat depending upon weather conditions, particularly the relative humidity.

After the enamel has been baked, the heads are surface sanded on the three edges and two faces. This is a hand operation and depends for its accuracy on the skill of the operator. Since the original casting was true and square, this sanding operation is little more than paint removal and an experienced operator will maintain all edges and faces in their original and correct angular relationship.

In order to correct any slight errors that may result from the sanding operation, the blade slot is broached. In this operation, a jig positions the head so that the slot is trimmed exactly at right angles to one edge since the 90 degree angle is the most commonly used one.

Assembly of the level follows, this is done on a carefully leveled surface plate so that the bubble is true with long side. The hole for the clamp screw is threaded and finally a brass insert pressed into the toe to form a receptacle for the steel scriber.

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USEFUL LITERATURE CATALOGS, MANUALS

to get any of the free materials described here, circle the appropriate number on the reader service cards bound into this issue

PROCESSES

The Investment Casting Process: 154
A four page brochure describing the investment casting process and outlining some of the many advantages of this method of fabrication has been published by Eco Engineering Co.

Casting Facility Report: 155
A 12 page facility report, containing helpful information for design engineers and purchasing agents concerned with the development and procurement of shell mold and investment castings, is now being released by Midwest Foundry Co.

Shell Cast Steels: 156
An 11 page brochure has been prepared by the Electric Steel Foundry Co. Information on the shell mold casting process, examples of castings that have been made and a table listing the various castable steels is included.

Brass Castings: 157
A new, two color, 24 page brochure describing the facilities of Hampden Brass and Aluminum Co. and giving much technical information on non-ferrous permanent mold, die and sand castings has been released.

Investment Materials: 158
Pre-Vest, Inc. has published a file folder concerned with the complete line of investment materials offered by the company. The various materials and their recommended uses are separately discussed.

Die Castings: 159
Die castings and their manifold uses, particularly on some of the 1956 cars are described and illustrated in the latest (vol. 23, no. 4) issue of the Alloy Pot, published by The New Jersey Zinc Co.

MATERIALS AND EQUIPMENT

Silicone Products: 161
A guide to the proper use and selection of silicone products has been published by the Dow Corning Co. Included in the 11 page brochure are two pages devoted exclusively to the use of silicone lubricants.

Temperature Measurement: 162
Illinois Testing Laboratories, Inc. has just issued a new bulletin briefly describing their line of temperature indicating and control instruments. Included in the bulletin is descriptive information on dewpoint measuring instruments and air velocity meters.

Cemented Carbide Guides: 163
Three new publications have been released by Adamas Carbide Corp. One is a listing and description of the complete line of tungsten carbide grades, another a guide to help determine the proper tool nose radius and the third a pocket-sized selector guide to aid in the selection of the proper guide of carbide.

Stainless Steel Data Sheet: 164
A new data sheet on type 301 stainless steel has been issued by Allegheny Ludlum Steel Corp. The sheet gives information on the physical properties, resistance to corrosion, resistance to oxidation, mechanical properties and other important reference data.

Bellows-Sealed Vacuum Valves: 165
A six page bulletin has been released by the Kinney Mfg. Div. of The New York Air Brake Co. describing the steel, cast iron and bronze vacuum valves manufactured by the company. Some data on Kinney vacuum pumps is included.

Leader Pin & Bushing Counterboring: 166
A special purpose tool designed to simultaneously counterbore for both leader pins and bushings is described in a folder that has been issued by Detroit Mold Engineering Co.

Die Casting Machines: 167
A new illustrated brochure has just been released giving a complete description of the line of die casting machines manufactured by Lester-Phoenix, Inc. Charts give comparative sizes, capacities, etc. for both zinc and aluminum.

Time-Fill Diagrams: 168
The Hays Mfg. Co., Industrial Sales Div. has published a wall size chart giving time fill data for flow rates from 0.2 to 2.0 gpm.

Sulfur Determination Apparatus: 169
The combustion unit for a high speed sulfur determination apparatus is described in bulletin LEP-1 from Lindberg Laboratory Equipment Div., Lindberg Engineering Co.

Gas Carburizing: 170
Gas carburizing and gas carburizing equipment are described in an eight page bulletin that has been issued by the Surface Combustion Corp. Technical data, operating information, process notes and illustrations of typical installations are given.

FINISHING

Automatic Drilling Unit: 174
A new catalog, No. 55-D, has been issued by Dumore Precision Tools which describes and illustrates their new series 26 Automatic Drill Unit. Also described is a new electronic repeat cycle timer to automatically withdraw the drill at desired intervals.

Buffing & Polishing Data Sheet: 175
A new data sheet has been published by Atlantic Compound Co. giving general information on Atlantic Greaseless Compound specifications, types of finish obtained and applications on a wide variety of materials.

Blast Cleaning Abrasive: 176
A bulletin describing a cast steel, heat treated, blast cleaning and peening abrasive has been published by Wheelabrator Corp. This eight page booklet contains, among other useful data, a tabular comparison of the characteristics of various types of metallic abrasives.

Continued on page 76

Nationally known window manufacturer finds:

HONITE Method cuts finishing costs on aluminum die castings up to 96%

1. **COST CUT 96.3%** on trimming a base part for a jalousie window unit. Old hand method cost .0027¢ per unit: HONITE Method costs .0001¢ per unit.
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USEFUL LITERATURE

Continued from page 75

Contour Following Abrasive Discs: 177
A complete descriptive brochure and price list are available from Foster Supplies Co. on their "Contur" coated abrasive discs and flexible rubber disc holders.

Abrasives for Deburring, Smoothing & Polishing: 178
A file sheet showing a few of the many applications of rubberized abrasives and some of the different types of unmounted tips available has been published by the Cratex Mfg. Co.

Abrasives Recovery Equipment: 179
An eight page brochure on the different types and sizes of abrasives separators and recovery equipment has been issued by the Pangborn Corp.

Power Screw Driver: 180
An attachment for the standard ¼ in. electric drill which converts the high speed drill to a lower speed, high torque unit for driving screws, nuts, etc. is described in a brochure from Supreme Products, Inc.

New Bodying Agents: 185
Two new bodying agents, designed to meet the requirements of the widest range of coating systems are described in a brochure from Nuodex Products Co., Inc.

Diamond Polishing: 186
The Elgin National Watch Co., Abrasives Div., have just published their Booklet No. 2 — Diamond Series which describes the methods, materials and equipment for metallographic polishing with diamond.

Tool Holders: 187
A new pamphlet has been issued by the Carboloy Dept. of General Electric Co. which describes and illustrates the line of tool holders for throw-away carbide inserts and illustrates a few of the throw-away inserts available.

Waste Disposal: 188
A fully automatic waste disposal system for the plating room is described and illustrated in a brochure from the Frederic B. Stevens Co.

Bonded Abrasive Tips: 189
A completely new line of high speed resin bonded wheels and points, designed to operate at 20,000 rpm and above is described in literature from American Diamond Saw Sales.

Air Cylinders: 190
Clamp type air cylinders with either one inch or two inch stroke and fitted for universal mounting are described in a brochure from Modernair Corp.

Protective Coatings: 191
Flame applied ceramic coatings to give a super refractory coating of ultra-hard properties are described in a brochure issued by The Montaine Corp.

Surface Improvement: 192
The Chromalloy Corp. has published a brochure "Applications of Chromizing" which describes the process, its advantages and some of the many applications.

Fluoborate Plating: 193
The advantages and uses of metal fluoborate plating chemicals are discussed in a pamphlet just published by General Chemical Div. of Allied Chemical & Dye Corp.

Hard Surfaced Aluminum: 194
Sanford Process Co., Inc. has published a brochure describing and giving the properties of their hard anodic surfaces for all aluminum alloys.

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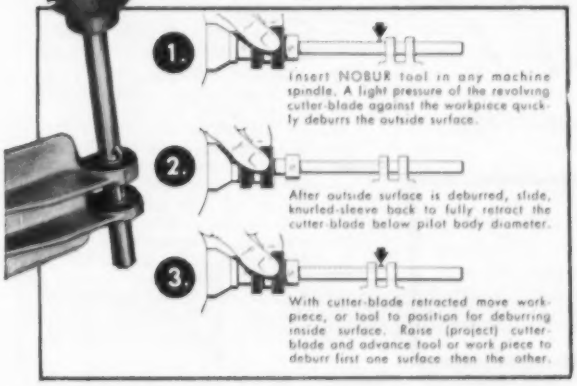

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2. After outside surface is deburred, slide, knurled-sleeve back to fully retract the cutter-blade below pilot body diameter.
3. With cutter-blade retracted move workpiece, or tool to position for deburring inside surface. Raise (project) cutter-blade and advance tool or work piece to deburr first one surface then the other.

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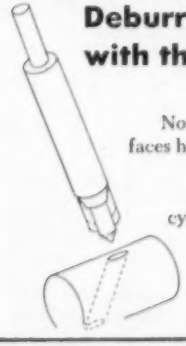

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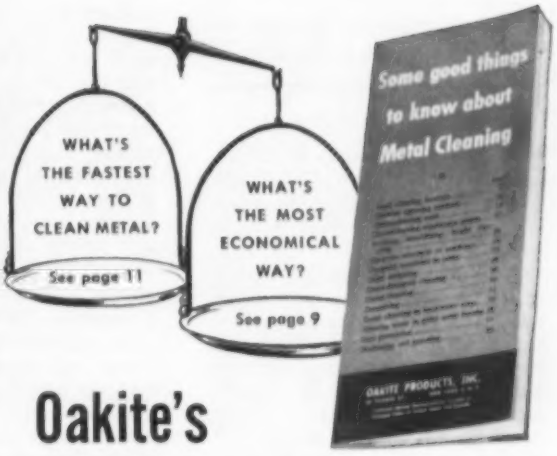
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See page 11
WHAT'S THE MOST ECONOMICAL WAY?
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DIE CASTING ALLOYS
continued from page 46

because of the absence of the inhibiting agent copper. This is one reason for abandoning the steam test, the corrosion effect is inaccurately severe.

A similar study has been made by the British, comparing AG40A and AC41A in normal indoor aging and dry aging at 200 F; the former for eight years and the latter for one year. [15] The results of this work are shown in Figure 8, where the greater stability of AG40A is apparent, particularly in the 200 F test. AC43A was not tested, as this is not included in Standard British Specifications.

More recently, the Canadian Department of Mines and Technical Surveys has tested AG40A and the effects of lead, tin and cadmium. [16] The necessity for the maximum limit on lead was confirmed, and some evidence was presented to indicate that the present ASTM maximum allowable tin is too high, and the present ASTM maximum allowable cadmium unnecessarily low. It should also be pointed out that Committee B6 has considered other impurities, nickel and chromium introduced from plated castings which are remelted, and manganese and silicon introduced with the aluminum. In the opinion of the Committee, these elements are not harmful if they do not exceed limits of 0.02% each for nickel and chromium, 0.05% for manganese, and 0.035% for silicon. [17]

In castability, each of the alloys has its partisans. AC43A is probably the most difficult of the three to cast due to a slightly greater hot shortness. High grade castings are made of both AG40A and AC41A, both for strength and for finish. It is interesting, however, that the volume of AG40A cast every year is several times that of AG41A, consequently, the preponderance of opinion would seem to favor AG40A. With current metal prices, there is also a cost differential in favor of AG40A due to the copper content of AC41A. Considering all factors, therefore, the weight of evidence is considerably in favor of the use of AG40A, and it would seem that the need for AC41A as a compromise alloy is very limited.

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39, p. 277 (1939); V. 46, p. 244 (1946) and V. 50, p. 168, (1950).
15 British Standard Specification 1003-4, "High Purity Zinc, Zinc Alloys for Die Casting and Zinc Alloy Die Castings", British Standards Institution, London, 1955.
16 R. C. Bell, J. O. Edwards, and J. W. Meier, "The Effects of Certain Metallic Impurities on the Properties of Zamak 3—Type Zinc-Base Die Casting Alloys", Canadian Mining and Metallurgical Bulletin, V. LV, p. 262, July 1952.
17 Report of Committee B6, Proceedings, Am. Soc. Testing Matls., 1955 Preprint.

BOUND BROOK OIL-LESS BEARING NAMES NEW COMPANY OFFICERS

Harold O. Johnson has been named chairman of the board of directors of Bound Brook Oil-Less Bearing Co., Bound Brook, N.J., in a recent action of the company's directors. At the same time, William R. Toeplitz was named president and Samuel S. Connor was named vice president and secretary. Mr. Toeplitz fills the vacancy created by the death of William Fisher Jennings who died in September 1955.

Mr. Johnson was executive vice president and treasurer prior to his new appointment, while Mr. Toeplitz was vice president in charge of engineering and Mr. Connor was sales manager.

Additional appointments at the same meeting of directors includes: E. B. Schoenly from production manager to factory manager and H. E. Thornton from plant engineer to chief engineer.

Mr. Johnson joined the Bound Brook firm in 1921 as office manager, progressing to production manager and sales manager. He was elected a director in 1928.

TAXIMETER

continued from page 52

The return lever cam represents a combination of gear and cam on a central shaft, produced with such close relative accuracy between the two forms that no machining is necessary to correlate their action. Cast with a gear having a 1.565 OD and 23 teeth, it also includes a cam with .656 radius.

A small steel investment casting is the main switch actuating cam, Figure 5c, that is cast to finished shape except for drilling one cross hole for a small taper pin. Center hole is cast straight, .251 + .001 −.000.

One place a beryllium copper casting was called into service in place of a steel casting is the ratchet hub, Figure 6a. This hub is used to operate the "extras" tabulation and is actuated by a lever that binds against the ratchet periphery of this casting. Center hole of the part fits over a steel stud in what amounts to a lap fit, with minimum acceptable tolerance of .001. Anything above this results in too much play on the stud and causes the dial to flop around. With steel, this tolerance could not be held. Added machining raised the cost of the part and, worse yet, the arm was continually breaking off.

Another heat treated beryllium copper casting is the brake actuating cam, Figure 6b, that has a face cam. Heat treating consists of first solution-annealing at 1475 F for three hours and water quenching immediately . . . then heat treating at 600 F for two hours and air cooling. Uniform expansion of this alloy during heat treating has made it possible to compensate for this expansion in original tooling, meeting design specifications without machining.

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Information on each of the many Fiske Lubricating Specialties is available in bulletin form. Send for bulletins describing lubricants of interest to you.

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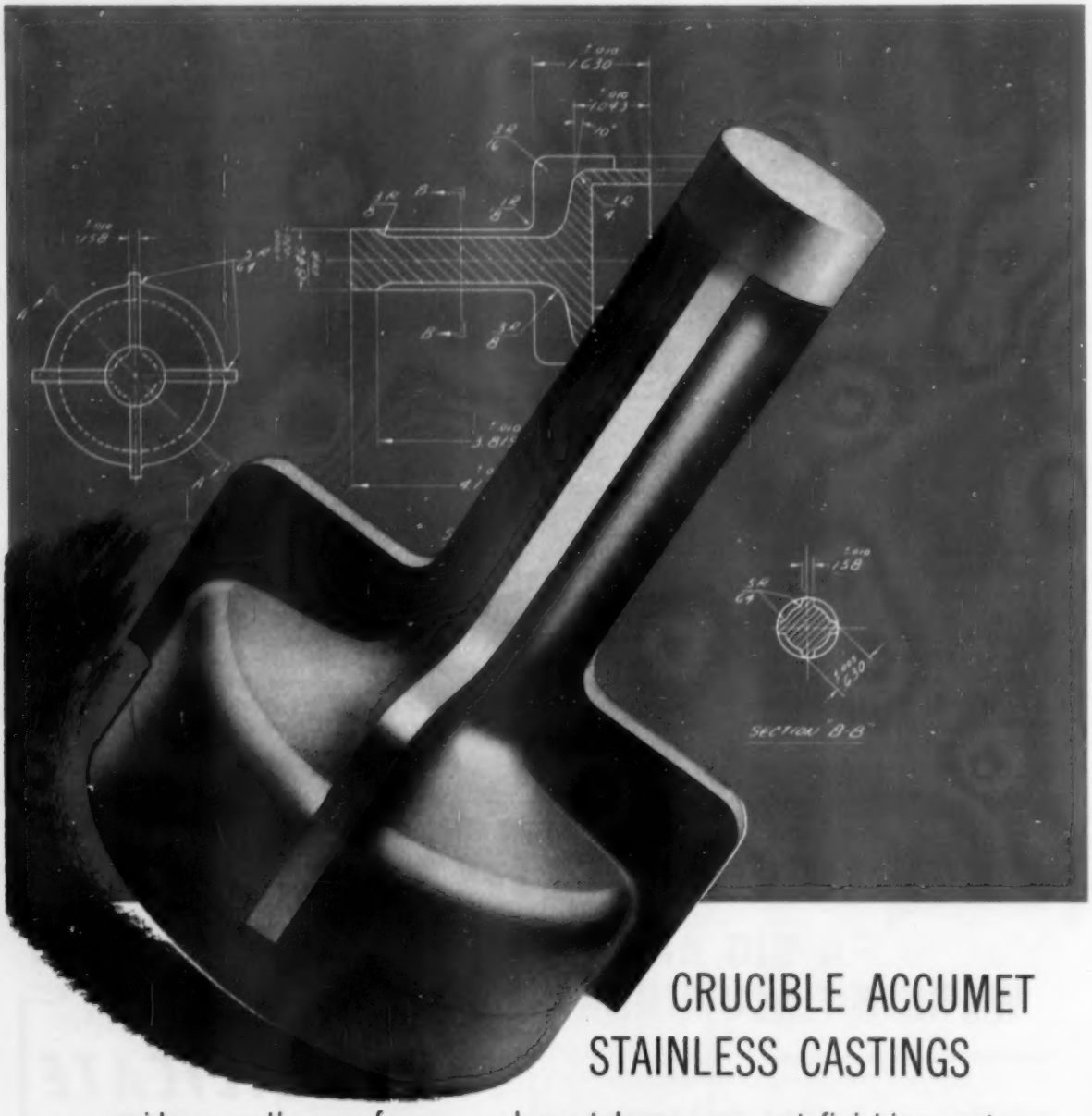


CRUCIBLE ACCUMET STAINLESS CASTINGS

provide smoother surfaces . . . closer tolerances — cut finishing costs

Even intricately shaped parts, like this cream separator neck piece, can be used essentially as-cast when produced by the ACCUMET method. That's because ACCUMET casting employs hot molds with special inner linings. You get castings on which thin sections are minutely defined . . . and with exceptionally fine surface finish. *Costly finishing operations are practically eliminated.*

On this stainless steel part, for example, the only finishing operations necessary are drilling and tapping of the stem section, grinding flats on the bow end, and polishing.

To minimize finishing operations on your products, consider the advantages of ACCUMET precision investment castings. Let your Crucible representative show you how their close tolerances, fine finish, and physical and metallurgical accuracy can spell substantial savings for you. And – to see what information is available on these and other Crucible special steels, write for your free copy of the "Crucible Publication Catalog." *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

For more information circle No. 23 on the Reader Service Card

QUALITY CONTROL
continued from page 56

is given approval to proceed with production.

Before pouring of castings can proceed, the purchaser should require that the foundry obtain approval on the metal to be used in pouring the castings. Where the foundry employs large master heats of metal (1000 to 7000 pounds) which are remelted and poured in small heats (7 to 15 pounds), approval should be obtained on the master heat before remelt and pouring of castings.

In order to obtain test material for master heat approval, the foundry will pour a mold, usually containing approximately 12 test bars, using a sample of metal properly taken from the master heat. In order to insure that this test material is representative of the castings to be produced from the same heat, the customer should require that the same mold preheat and metal-pouring temperatures be used in producing the test material as will be used in making the subsequent castings.

Master heat approval may be obtained from the customer by either of the following methods:

1. The test material is analyzed and physically tested by the foundry. If the results of these tests indicate that the material meets the requirements of the customer's material specifications, the foundry may use the heat of metal, certifying the analysis and properties of the heat to the customer.
2. The test material is submitted to the customer for analysis and test. The customer approves the master heat on the basis of his own tests, and the foundry may proceed with the use of the particular heat.

In order to guarantee that the castings produced from a remelt of the master heat have the properties of the test material, the customer should place certain requirements on the foundry with respect to the major processing variables. For example, if the foundry, because of problems such as X-ray quality, desires to change the metal-pouring temperature, he should notify the customer and obtain approval. In some cases, the foundry should be required to submit new samples when such a change is required to assure the buyer that no change in the quality of the castings has occurred.

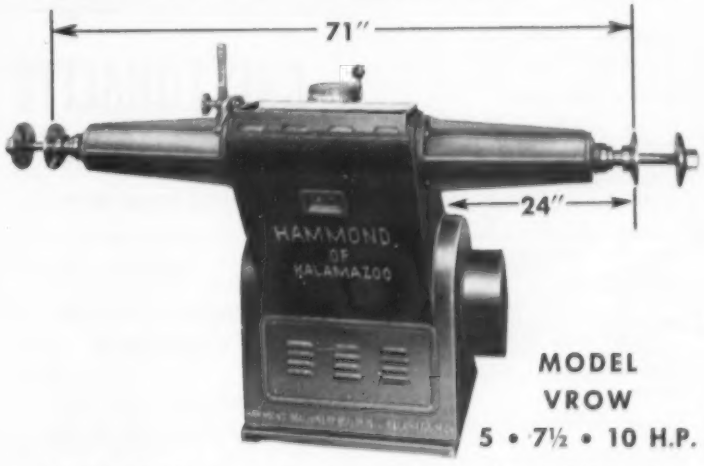
If the castings are to be poured directly from the master heat, instead of from remelts, the purchaser should require that test bars be poured at the same time as the castings. These test bars are then tested and certified by the foundry or submitted along with the castings to the purchaser for his tests.

Additional controls may be required of the foundry to assure the customer that the metal used in pouring the castings meets the requirements of the specification. For example, in the case of ductility requirements, common practice for certain investment cast alloys requires that bend wires be cast in each mold. These wires must pass a certain degree of bend before the castings are acceptable.

For some alloys, in which carbon content is critical, a magnetic comparator may be used for checking castings. This instrument can be employed in checking 100 percent of the castings to determine whether they are within the range allowed by the specification. In addition, where possible, the customer may require that all the castings be hardness-tested to determine whether they meet the requirements of the metal specification.

Hammond OF KALAMAZOO

WIDE—SWING
POLISHING AND BUFFING LATHE



MODEL
VROW
5 • 7½ • 10 H.P.

Ideal for bulky parts. Spindle overhang and extended bearing housings enable two operators to work without interfering with each other.

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Other models available with a capacity up to 50 HP. *Write for catalog* showing America's most complete line of Polishing and Buffing Lathes.

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For more information circle No. 37 on the Reader Service Card

Check AND Compare

the features of
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with the process you are now using

Luster-on®
ALUMINUM SEALER

- ✓ produces a chromate film on aluminum that provides excellent corrosion protection and serves as an ideal paint base
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See for yourself the superior results obtained with new Luster-On Aluminum Sealer.

Send sample for free laboratory treatment.

THE *Chemical* CORPORATION
66 Waltham Avenue, Springfield, Mass.

Circle No. 74 on the Reader Service Card

STAINLESS STEEL
continued from page 42

Austenitic (non-hardenable) types No. 302, No. 303, No. 309, No. 310 and No. 316; and the Martensitic (hardenable) types No. 410 and No. 431. There are, of course, many other alloys as well as variations of those listed.

The properties listed can be considered representative for sound investment castings have a section size of about one-quarter to one-half inch thick. In any particular part, of course, the properties obtained will depend on the design. Close collaboration, then, between designer and caster, will assure the most effective utilization of the process, and the casting of a more perfect product — with savings that begin at the design stage.

CHANGES NAME CHROMALLOY CORP.

A change in company name from Chromalloy Corporation of New York to Chromalloy has been announced by Richard P. Seelig, executive vice president.

CRISTOBALITE

The ideal grade for
Dental Investment Compounds
and
Precision Casting Compounds

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538 FOREST STREET, KEARNY, N. J.

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OPPORTUNITIES

Rates: $20 for the first column inch, $15 for each additional inch payable in advance

OPPORTUNITY FOR METALLURGIST OR ENGINEER interested in the precision casting field to do engineering-sales work for producer offering every chance to advance with the business. Experienced production know-how and product contact necessary. Write Box 2156, PRECISION METAL MOLDING.

FOR SALE—die casting machine Zinc-Kux K-5 die space 13" x 6" between bars. Castings up to 1 pound in zinc. Has had little use. Write Box No. 2256, PRECISION METAL MOLDING.

DIE CASTING ENGINEER—experienced in jobbing production work on aluminum die casting operations. Must be able to supervise all phases of die repair, die maintenance problems and production methods. Engineering background is preferred, but degree not necessary. This is a good opportunity for a young man experienced in the die casting field, who has the ability, energy and interest to join an expanding company. Write, giving age, education, experience and salary desired. All replies will be treated with strict confidence. Oswego Castings Corp., Div. of Oberdorfer Foundries, Inc., Oswego, N. Y.

WANTED—Used 200-ton or over standard make zinc die casting machine. Require min. 14" x 18" spacing between tie bars. Write to Electro-Voice, Inc., Buchanan, Michigan, Attention: J. N. Grieveson.

DIE CASTING ENGINEER — EXTRAORDINARY SHOP THROUGH MANAGEMENT BACKGROUND—Experienced aluminum and zinc from DCMT machines to 400 ton presses. Age 31 — presently employed mid-west desires to relocate to east or west coast. Five figure salary plus incentive desired. Write Box No. 2356, PRECISION METAL MOLDING magazine.

ESTIMATOR WANTED—Experienced for precision investment castings. Good pay. Progressive expanding company. Alloy Precision Castings Co., E. 45 at Hamilton, Cleveland 14, Ohio.

SALES REPRESENTATIVE — Long established eastern manufacturer of powdered metal structural parts is desirous of obtaining representation in Illinois, Indiana, Michigan, Texas and Southern States. Write Box No. 2456, PRECISION METAL MOLDING magazine.

Ready-Made Sales

WANTED—
In-State Suppliers of

- Industrial Chemicals
- Abrasives
- Lumber and Wood Products
- Electronic Equipment Parts
- Aluminum Extrusions
- Metal Stampings, Malleable Iron and Light Metal Castings
- Paper Products
- Rubber Products
- Industrial Ceramics
- Textile Mill Supplies

The vigorous industrial growth of North Carolina has developed bright opportunities for additional companies which can furnish supplementary parts and supplies.

Quantity buyers within the State provide a very desirable market for new North Carolina producers of a wide variety of needed items.

A survey of many companies operating in North Carolina has provided definite knowledge about supplies and parts which could advantageously be purchased from new in-State producers.

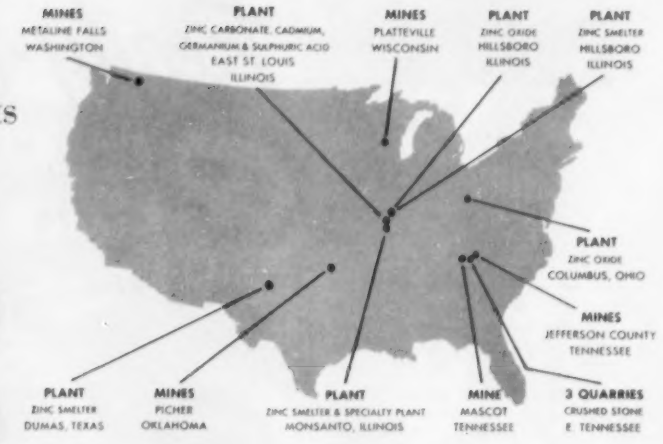
The partial list of supplemental parts and supplies shown here is representative of a market of better than $200,000,000. If your company is interested in establishing operations in North Carolina to supply any part of this awaiting market, get in touch with the Director of the Department of Conservation and Development, Raleigh 17, North Carolina.

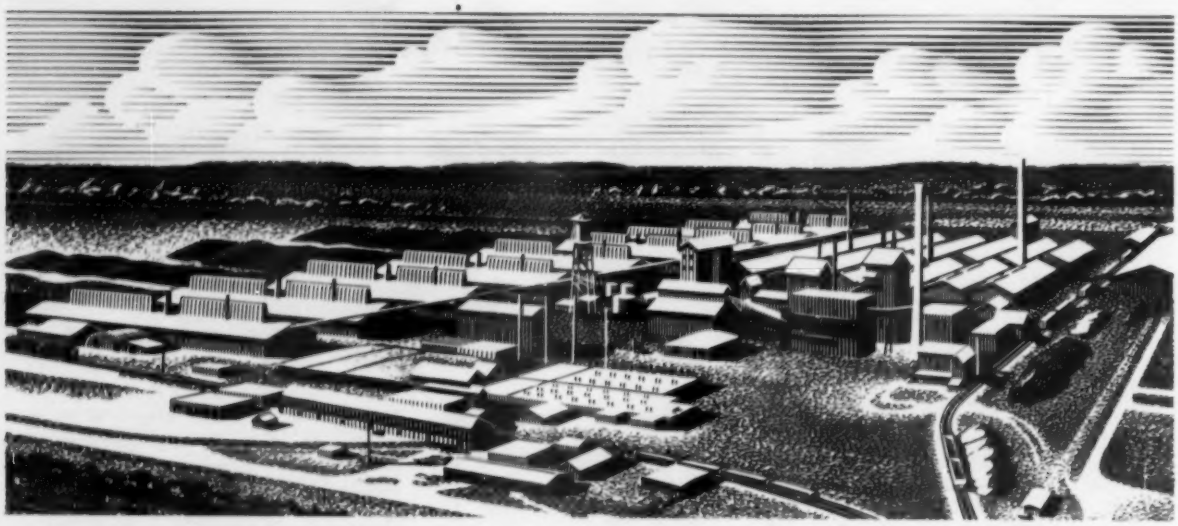
The new brochure "Industrial Location Factors" will be sent free upon request

Friendly North Carolina Where Industry Prospers

For more information circle No. 58 on the Reader Service Card

American Zinc and its products *from* A *to* Z





SMELTER AT DUMAS, TEXAS

Dumas is one of the larger horizontal retort furnace plants in the United States. Here are produced Prime Western, Select, Brass Special and Intermediate grades of slab zinc for the galvanizing and brass industries. Roasting and sintering operations are also carried on at Dumas, making this plant an important factor in the widespread American Zinc picture.

PRODUCERS OF

ALL GRADES OF SLAB ZINC
ZINC ANODES (Plating & Galvanic)
METALLIC CADMIUM
SULPHURIC ACID
LEAD FREE and LEADED ZINC OXIDES
ZINC CARBONATE
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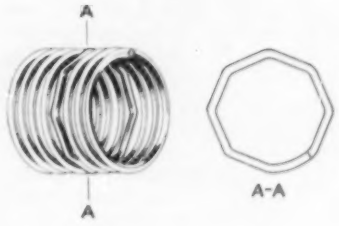
to get any of the free materials described here, circle the appropriate number on the reader service cards bound into this issue

PRODUCT NEWS AND DEVELOPMENTS

LOCKING INSERT ELIMINATES WASHER, LOCK NUTS, WIRES



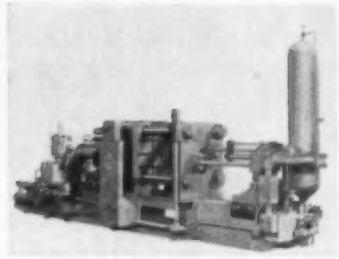
For those applications where threaded fasteners tend to become loose due to vibration, a new wire thread insert has been developed.

Like other inserts made by the same company, the new unit is said to require no more boss diameter or wall thickness than a conventional tapped thread; thus it can be incorporated into an otherwise frozen design.

Positive locking is achieved by forming one or two coils in the middle of the insert as octagons instead of circles. Pressure of the screw passing through this section forces the deformed section to assume a circular shape. The chords of the circle thus press on the screw to give the desired locking effect.

Heli-Coil Corp.
For more information, circle No. 205 on the Reader Service Card

DIE CASTING MACHINES DESIGNED FOR LATER EXPANSION



A line of die casting machines with nominal capacities of 250, 450, 650 and 850 tons in either hot or cold chamber models have been introduced.

These machines, as basic tools, are equipped with only the essentials required for immediate production. Then, as production requirements change, additional features can be added fast, at low cost and at the plant location.

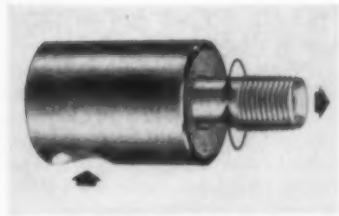
All machines are equipped with a locking device that automatically takes up clearances in dies caused by heat expansion. The knuckled joint eliminates shear stresses on the pins when under locking pressure.

Improved manifold valving greatly reduces piping and joints. Flexible sequencing corepull valving eliminates the specialist ordinarily required to make changes from one sequence to another.

Machines equipped with a hot chamber injection unit feature a furnace that can be adjusted from the machine center line to positions below center. A water cooled jacket around the injection cylinder ram reduces packing failure.

Lake Erie Engineering Corp.
For more information, circle No. 206 on the Reader Service Card

LOW COST SWIVEL JOINTS FOR HYDRAULIC/PNEUMATIC USE



A new line of lightweight, low cost, small size swivel joints, designed especially for hydraulic or pneumatic service on pipe, tubing or hose has been announced. The new joints are single plane type as contrasted with others made by the same company that are self aligning swivel types. The design is primarily for up to 360° turning or rotating motion on machinery or other places where flexible piping or tubing is required.

One of the chief advantages is that these joints provide for long service life without maintenance or replacement. They can be used advantageously as connectors for hose in reducing the hose length by eliminating sharp bends and increasing hose life by relieving all twisting stresses.

Barco Mfg. Co.
For more information, circle No. 207 on the Reader Service Card

Continued next page

For more information circle No. 54 on Reader Service Card

Geared to Variety

MERRIMAN BROS., INC.

Originators of

SINTERED HELICAL GEARS

Also: POLE PIECES, SPUR GEARS, CAMS, RATCHETS, PAWLS AND ALL TYPES OF STRUCTURAL PARTS.

If your present costs are high, why not see how MERRIMAN can offer you low cost, quality parts from Powdered Metal in

BRASS, BRONZE, COPPER, NICKEL SILVER, STEEL, IRON AND IRON ALLOYS INCLUDING COPPER INFILTRATION.

INQUIRIES INVITED

POWDERED METAL DIVISION
MERRIMAN BROS., INC.
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Sure Over 100,000 SHOTS per set is a LOT!

BUT You Get it with . . . .
AUTO-DIESEL PLUNGER RINGS

AUTO-DIESEL Hardened Steel Plunger Rings are setting records that were unheard of a short time ago. IN MANY PLANTS THEY ARE GIVING OVER 100,000 SHOTS PER SET. (Names supplied upon request). Many didn't believe our claims but a test proved they were correct. They last for MONTHS instead of HOURS and will give die casting machines much longer life. Made of cast iron, dieloy cast iron or hardened steel. It will pay to write for information.

You Get . . .
LONG LIFE from AUTO-DIESEL
TWO or THREE PIECE PLUNGER SEGMENT RINGS

LONG LIFE reduces down-time and expensive repairs. That is why AUTO-DIESEL 2 or 3 Piece Plunger Segment Rings save you money. They are made of high grade wear resisting iron in sizes from 1½" to 4" by ⅞" especially for hot chamber and die casting machines.

Write for Details

THE AUTO-DIESEL PISTON RING CO.
3135 Superior Avenue • Cleveland 14, Ohio
"RINGS and SHAPES Since 1921"

For more information circle No. 8 on the Reader Service Card

FIRE-RESISTANT FLUIDS . . . for hydraulics and lubricants

The manufacturer of one of the fire resistant synthetic oils has just announced that the series of materials now available has been expanded to include hydraulic fluids and lubricants in six controlled viscosities. These fluids, described as being straight phosphate esters, are now made in the viscosity range of 90, 150, 220, 300, 500, and 1000 SUS seconds at 100 F.

Addition of these viscosity ranges has broadened the use potential for these fluids in industries where fire-resistance in functional fluids is a significant safety factor.

These fire-resistant fluids are finding increasing useage in place of flammable petroleum oil products in die casting, metal forming and allied industries.

Celanese Corp. of America
For more information, circle No. 208 on the Reader Service Card

CHEMICAL CONVERSION COATING . . . for cadmium coated parts

A new chromate conversion coating for cadmium that will produce a bright clear finish with corrosion protection has been introduced.

The material is said to be particularly useful for those installations where space is a factor. By using the new coating two tanks are eliminated from the normal chromate leaching.

The Chemical Corp.
For more information, circle No. 209 on the Reader Service Card

WATER SOLUBLE CLEANER . . . removes buffing compound

A new water soluble cleaner for both ferrous and non-ferrous metals has been announced.

The new cleaner is mildly alkaline (pH about 9 in the concentration used), but not an alkali cleaner the usual sense of the term. The material is reported to be both non-toxic and non-flammable.

When parts are cleaned prior to shipment a conventional spray-rinse is sufficient. If painting or phosphatizing is to follow the cleaning the soak cleaning is followed with a spray clean and then a spray rinse. Before plating an additional reverse current cleaning is recommended.

Cowles Chemical Co.
For more information, circle No. 210 on the Reader Service Card

Continued on page 89

For more information circle No. 24 on the Reader Service Card

LAYOUT FLUID

Ask for
Free Sample

IDEAL FOR MOLD MAKERS

DAYTON ROGERS
Manufacturing Company
MINNEAPOLIS 7Y, MINNESOTA

Drill More Holes Per Hour
In ANY Pattern . . . On ANY Drill Press

with a *Adjustable* **MULTI-DRILL**

DRILLS 2 to 8 HOLES at ONE STROKE

Increase production up to 800% . . . save time, cut costs. MULTI-DRILLS make *any* drill press produce *more*. Attached without alterations or special tools. Quick, easy setups of universally adjustable spindles give you more flexibility . . . wider application. Handles any hole pattern within 9" circle; centers close as ½". Extension Spindles available to increase working area to 22½". Special adaptations available.

model 900

See your Commander Distributor for complete details. Write for the NEW Commander Full Line Catalog #851.

COMMANDER MFG. CO.
4213 W. Kinzie St. • Chicago 24, Illinois
Product of *Commander* . . . Builder of Production Tools

For more information circle No. 14 on the Reader Service Card

"TREE SURGERY"
can now be done by the Do-It-Yourself "boys"
with a lightweight DIE CAST ALUMINUM 3-WAY TREE TRIMMER

The "Do It Yourself" market is steadily increasing the demand for easy-to-handle, rugged and economically priced tools for use in and around the home. Of great importance in the manufacture and marketing of such implements is the use of aluminum and magnesium die castings. For example, this 3-Way Tree Trimmer, tough and mechanically strong, is diecast from light weight aluminum by LITEMETAL and has considerable cost saving and selling advantages. Die casting this product in aluminum reduces production costs by minimizing machining and finishing operations . . . creating a more competitive selling position. Other important selling factors are its light weight which diminishes fatigue involved in sawing, cutting-up or cutting-down and the savings effected in freight rates. Light, fast and versatile, the 3-Way Tree Trimmer is sold by Glendale Industries, Inc. of Toledo, Ohio.

Let's Talk It Over . . .

LITEMETAL DICAST, INC. is an organization of specialists — men thoroughly experienced in the casting and machining of magnesium and aluminum alloys. Our equipment includes big machines for big jobs — little machines for little jobs . . . the right sizes and types of the most modern die casting equipment for producing parts from the size of a button to large cable spools. Complete facilities for secondary operations are also available.

Write today for literature and design information. Quick action on inquiries.

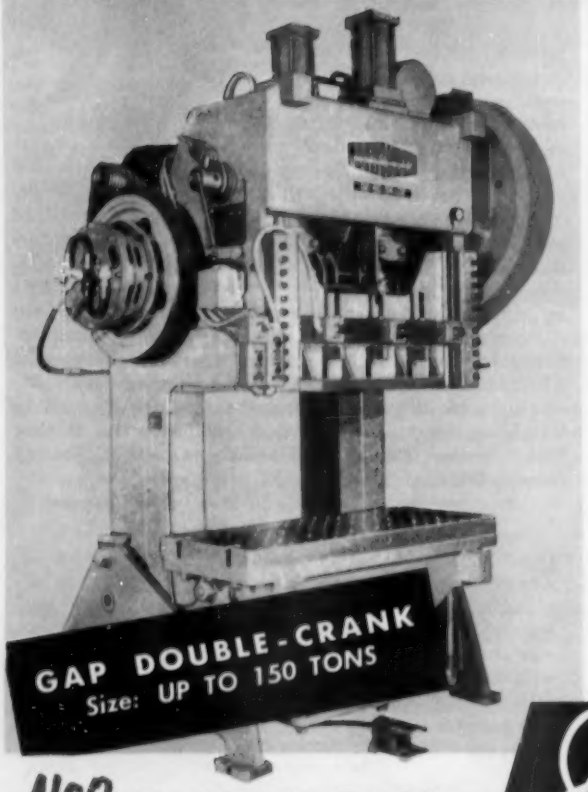
LITEMETAL DICAST Inc.
A DIVISION OF HAYES INDUSTRIES
1925 WILDWOOD AVE. • JACKSON, MICHIGAN
PLANT AND EXECUTIVE OFFICES

For more information circle No. 47 on the Reader Service Card

JOHNSON

INTRODUCES

TWO NEW SERIES of PRESSES



- **Box Type Ram**
- **Steel Fabricated**
- **Air Clutch (low inertia)**
- **Electrical Controls**
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Write for Bulletin 1956

***Also* 22 MODELS OF OBI MECHANICAL PRESSES from 16 to 125 Tons Capacity**

Johnson MACHINE and PRESS CORP.
620 WEST INDIANA AVENUE • ELKHART, INDIANA

For more information circle No. 41 on the Reader Service Card

NON-LOADING SAND PAPER
. . . for soft materials

Loading of finishing paper, particularly when sanding paints, lacquers and enamels, is the principal cause of the short life of these materials. To overcome this trouble, a new finishing paper has been introduced that effectively ends the loading so that the paper can be used until the abrasive grains are worn down.

In addition to solving the loading problem the new sheet is said to act like a wet sheet when used dry. Estimates by the manufacturer based on actual field tests indicate that a minimum saving of 26 percent can be expected.

Armour & Co.
For more information, circle No. 211 on the Reader Service Card

THROW-AWAY CARBIDE INSERTS
. . . in a complete size line

What is claimed to be the most complete range of styles and sizes of carbide inserts and throw away holders has been introduced.

The basic holders and inserts have been on the market for about a year, but the line has now been greatly expanded. There are two ranges, general purpose and heavy duty, and each range has three thicknesses for any application. Each holder will accommodate any of the three thickness inserts through the use of the proper carbide shim, this is reported to avoid the uneconomical use of inserts that are too thick for the work.

Valenite Metals Corp.
For more information, circle No. 212 on the Reader Service Card

TAP SHARPENER
. . . for improved function

An improved model of one of the well known tap sharpeners is now being marketed.

The new model allows greater clearance for the head pivot due to added height of the upright member of the base casting. Push buttons on the head, which control the indexing or amount of turn on the tap, have been improved and strengthened. The head itself adjusts quickly from 0 to 90° angle to the grinding wheel.

The unit is designed to sharpen either left or right hand taps of two, three or four flutes.

Rockford Tool & Die Works, Inc.
For more information, circle No. 213 on the Reader Service Card

For more information circle No. 68 on the Reader Service Card

We Moved Fast Into Our New Plant!

And now we are all set up to provide you with zinc die castings which combine more than half a century of experience with the vision of the future. Here we have every modern facility to produce castings which excel in design, appearance, performance and strength. We would like to tell you how our set-up fits into **your** needs.

INQUIRIES INVITED

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how Ajax induction melting meets investment casting requirements

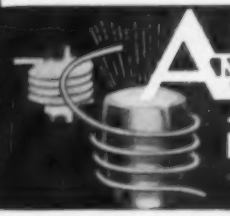
. . . at Precision Metalsmiths, Inc.

The special melting requirements of precision investment casting are an old story to Precision Metalsmiths, Inc., Cleveland, Ohio. This one foundry melts ninety-two different ferrous and nonferrous alloys . . . often in small quantities. Many of these alloys require unusual protection from contamination during melting—and substantially all are made to extremely close analyses. Carbon content in some must be kept below .04%.

Only an Ajax-Northrup converter-powered induction melting unit could meet the requirements of versatility, purity, and economy so well. That's why four Ajax units now satisfy all the company's production needs. Three 17 pound capacity portable furnaces are each powered by 20 kw Ajax-Northrup spark gap converters; and the fourth, a fifty pound capacity tilting furnace, is powered by a 40 kw Ajax-Northrup converter.

Precision Metalsmiths standardized on Ajax because Ajax-Northrup units cost far less to operate and maintain in operation. They're ruggedly constructed to take the toughest kind of service in stride. Normal converter maintenance is limited to cleaning the gap chamber and inspection at three month intervals. For additional details, write Ajax Electrothermic Corp., Trenton 5, New Jersey, requesting Bulletins 14-B and 27-B.

Associated Companies: Ajax Electric Company—Ajax Electric Furnace Co.—Ajax Engineering Corp.



AJAX NORTHRUP SINCE 1916

INDUCTION HEATING-MELTING

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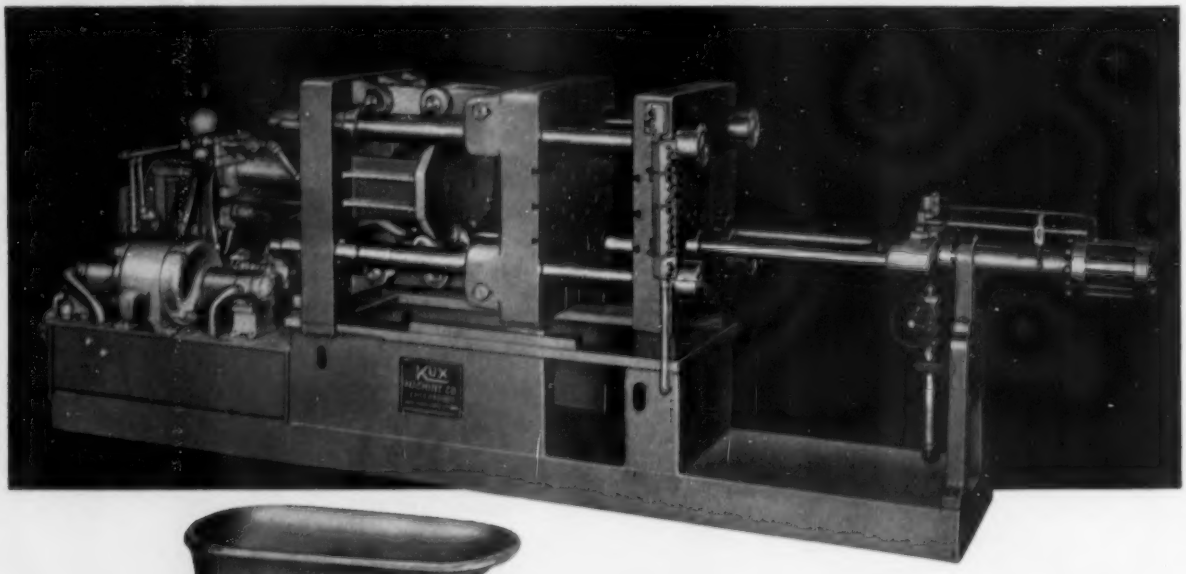

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DIE CASTING MACHINES

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"Our products are sold primarily to women, who are attracted by two qualities: good looks and a bargain price," writes Mr. W. B. Sheeler of the Enterprise Manufacturing Company of Philadelphia.

"Kux machines give us the beauty of a hardware finish at an amazingly low cost per unit.

"We use them to cast aluminum tops for our *Home Aid* Freezer, and aluminum bases for our *No Clamp Chopper* and our *Shredder-Slicer-Grater*.

"Our engineering department selected the Kux machine primarily through recommendations of other firms using this machine," continues Mr. Sheeler. "The courtesy and service extended by the Kux people, in addition to the features of the multiplier, made our choice a certainty." (The exclusive patented Kux Multiplier increases the ending pressure up to five times the starting pressure, producing the most solid of die castings.)

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MODEL HP 37 ILLUSTRATED

Hydraulically operated die casting machine for production of aluminum casting weighing up to 10 pounds.

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NEWS OF INDUSTRY AND ASSOCIATIONS

P. U. GUMMESON NAMED HOEGANAES V. P.

Per Ulf Gummeson of Morristown, N.J. has been appointed vice president and general manager of Hoeganaes Sponge Iron Corporation, 545 Fifth Avenue, New York City, according to a statement of Gerald F. Finley, president.

Mr. Gummeson is a graduate of the Royal Institute of Technology in Stockholm, Sweden, where he

Per Ulf Gummeson

received a degree in metallurgy. He has also done graduate work in this field. Gummeson was formerly associated with Hoganas-Billesholms A/B in Hoganas, Sweden, in the Technical and Research Division.

CANADIAN INVESTMENT CASTER BUILDS NEW PLANT

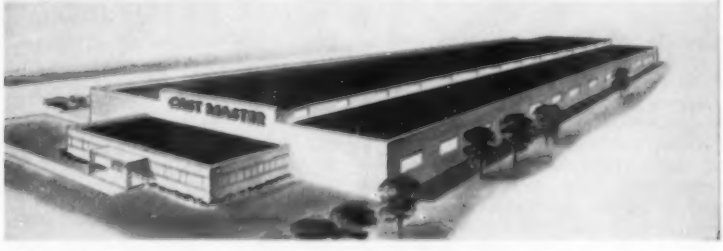
The Deloro Smelting & Refining Co. Ltd., manufacturers of Stellite superalloys in Canada for 40 years, have expanded their finished product manufacturing into a new 75,000 square foot plant at Belleville, Ontario. Since January 1st, 1956, the division operated under the name "Deloro Stellite".

Initially 200 people are employed producing Stellite components, standard on much equipment, allowing industry to meet the greatly exhilarated wear of faster production, high temperatures and chemical corrosion.

For production of such original equipment requirements as pump sleeves and impellers, drill chucks, valve faces and slitters, the company is said to have the largest investment casting installation in Canada and one of the largest on the continent. This installation is augmented by a new shell molding section.

These facilities will also produce castings in many other materials, including brasses, steels, aluminum and nickel base alloys.

NEW CAST-MASTER PLANT DOUBLES FLOOR AREA



Completion of a new manufacturing plant with doubled operating area has been announced by Cast-Master, Inc., builders of die casting machines. The move into the enlarged quarters at 23901 Aurora Rd., Bedford, Ohio, was completed last month, according to L. R. May, general manager.

New plant and office area totals about 34,000 square feet, and includes installation of a great deal of new, larger machining equipment.

Cast-Master, formed five years ago as a separate division of Miller & Taylor Tool Co. which had been building die casting machines for many years, is headed by C. E. Taylor, president, and H. P. Miller, vice president.

Cast-Master, manufacturing hot and cold chamber zinc and aluminum machines, recently announced its production of the new Dow hot chamber magnesium die casting machines.

MT. VERNON DIE CASTING CELEBRATES 50TH YEAR

Fifty years of die casting are being celebrated this year by Mt. Vernon Die Casting Corp. of

Gustav Nyselius

Stamford, Conn. The company, which moved in recent years from Mt. Vernon, N. Y., to a larger plant in Stamford, is a major producer of zinc and aluminum die castings.

Active leadership in the firm is in the hands of Gustav Nyselius, president of Mt. Vernon Die Casting Corp.

ZINC INDUSTRY CELEBRATES FIRST MILLION TON YEAR

Domestic production and consumption of slab zinc in 1955 broke all industry records, John L. Kimberley, recently appointed executive vice president of the American Zinc Institute has announced. The American Zinc Institute estimates that final figures for U. S. smelter production for 1955 will prove to have exceeded 1,025,000 tons while smelter shipments for the same period should have gone well over 1,100,000 tons.

Institute figures show that previous high peacetime smelter production was 971,191 tons in 1953 and previous high wartime production was in 1943 with 971,873 tons. Until 1955 the record for smelter shipments was set in 1947 with 955,816 tons shipped.

Kimberley reported that once again the largest consumer of slab zinc during 1955 was the galvanizing industry with an estimated 430,000 tons consumption. The die casting industry is second

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This new direct-casting Detroit Electric Furnace produces better precision castings in less time. Fast, indirect arc melting plus direct furnace-to-mold casting cuts production cycle to as little as 7 minutes.

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with an estimated 380,000 tons of slab zinc consumed. This means that galvanizing is up some 8% over 1954 figures while die casting has boosted its consumption 37% over the same period for 1954.

DIE CASTING ENGINEERS TO FORM CLEVELAND UNIT

A new chapter of the Society of Die Casting Engineers, Inc., will be organized in Cleveland at a meeting to be held February 15 at the Manger Hotel. Harry Cagin of Halex Die Casting Co.,

Alfred Sugar

acting chairman of the Cleveland group, has invited interested individuals to attend the session which will feature an address by Alfred Sugar of Alloys & Chemicals Mfg. Co., Inc. His topic will be alloys and melting practices in the die casting industry.

Dinner is scheduled for 6:30 p.m.; reservations should be made with the secretary, L. E. Pearch of Rex Buckeye Co., 5709 Dennison Ave., Cleveland. The meeting is scheduled for 8 p.m.

Objective of the Society, formed little more than a year ago, is "the improvement and dissemination of the knowledge of the arts and sciences of die casting, and of finishing of metals and of allied arts."

DU-WEL COMPLETES PLANT EXPANSION

Du-Wel Metal Products Co. have now completed their construction program which was started last September. An additional 4500 square feet of manufacturing area has been added to the rear of the plant, and 500 square feet of office area added to the front of the building. Total area now is 35,000 square feet.

This additional room will permit the installation of a new 600 ton die casting machine scheduled for delivery in February. The new die casting machine will make a total of 11 die casting machines being operated in the plant.

APEX EXPANDS PLANT ON WEST COAST

Apex Smelting Co., one of the nation's largest smelters and alloyers of aluminum, has started construction of the second stage of its program of its California smelting plant in the Los Angeles industrial area near Long Beach, which will immediately double the capacity of this plant.

Louis Lippa, president, announced that initial work was under way for an addition to the plant, with completion scheduled

Louis Lippa

for early 1956. The original plant, which went into production in May of 1953, stands on a 20-acre site at 2211 East Carson Street, Los Angeles.

The operation of this plant is under the management of Dwight L. Palmer, a vice-president of the company.

Besides its California facilities, Apex operates large smelting plants in Chicago and Cleveland. Executive offices are in Chicago.

B&T MACHINERY ACQUIRES B&T ENGINEERING, SALES

Louis W. Blauman and E. Martin Tallberg, principals of B&T Engineering and Sales Company, Detroit, Mich., have announced the acquisition of their company by B&T Machinery Company, an affiliate of Buss Machine Works, Holland, Mich. B&T die-casting machines have for several years been manufactured by the Buss affiliate, and company executives believe that the closer corporate relationship resulting from the merger will strengthen the company's position to the benefit of present owners as well as future purchasers of B&T equipment.

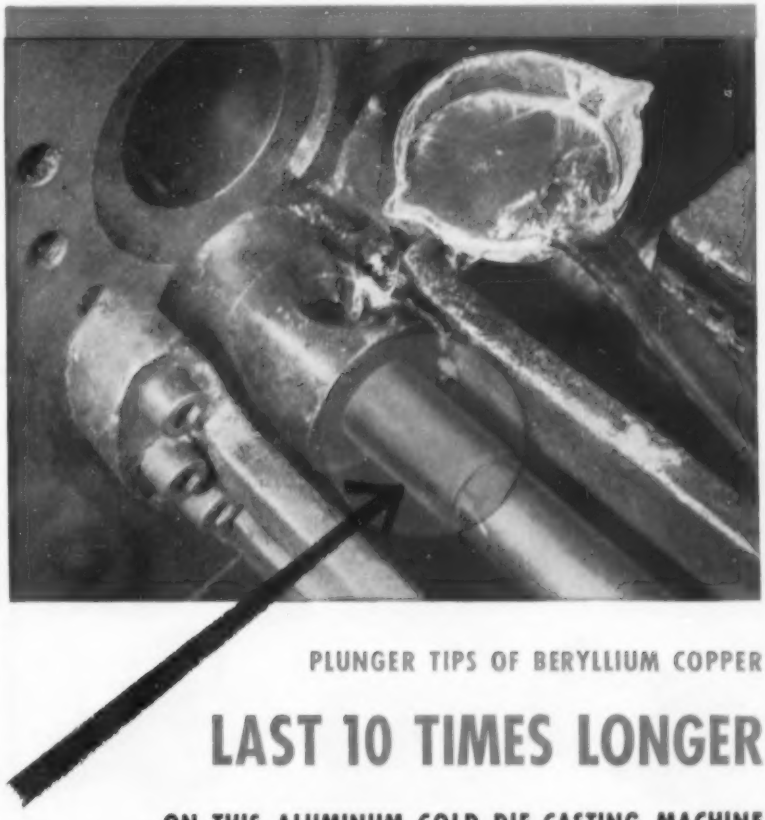
B&T offices in Detroit will be retained, and sales and engineering functions will remain under the direction of Blauman and Tallberg. The present staff of engineers and sales representatives will continue intact.

Jay H. Petter, president of Buss Machine Works, points out that, while no actual change of operation or administration has taken place, the new affiliation will lend stability and continuity to B&T, and assure die casting machine owners of permanent service facilities.

NEW MISCO PLANT DOUBLES CAPACITY

Misco Precision Casting Company of Whitehall, Mich., has announced that it is building a new plant in Muskegon, Mich., for the production of investment castings in the aircraft industry castings. Theodore Operhall, president of Misco, announced that the growing need for investment castings in the aircraft industry indicated that additional capacity will be required by the company.

The Whitehall operation currently employs 550 people and the Detroit operation 275. At the present time Misco has in operation between the Detroit and



PLUNGER TIPS OF BERYLLIUM COPPER

LAST 10 TIMES LONGER

ON THIS ALUMINUM COLD DIE CASTING MACHINE

The Ohio Die Casting Company, using a 2" diameter by 4" long "BERYLCO" beryllium copper tip to drive molten aluminum through a sleeve into die cavities, ran more than 51,000 cycles without a tip failure.

The tip of beryllium copper, turned to an initial fit of 0.0005" clearance, and subjected to constant pounding of 150-160 cycles per hour and to temperature extremes of 1200°F. aluminum and the effects of the water cooling system, operated without sticking or excessive wear. It was once used through an entire 8-hour shift without water cooling!

The advantages of "BERYLCO" beryllium copper—thermal conductivity, wear resistance, and ductility—make it the ideal metal for use in plunger tips. For specific details of this application, request Technical Bulletin #29.

THE BERYLLIUM CORPORATION
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ENJOY CONSIDERABLE SAVINGS IN COST, LABOR AND TIME!

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IN COSTS, LABOR AND TIME

Has camtrack cast. Offers considerable savings in machining and set-up time as well as in making of fixtures that would ordinarily be required. Cast in 1045 carbon steel.

DETAILS TO CLOSER TOLERANCES

Made in 356 Aluminum. Incorporates details difficult to mill and groove. Slots are held to .005" tolerances.

FEWER MATERIALS REQUIRED

Cast in 304 stainless steel. This generator part requires only minor secondary operations prior to assembly. Production costs are lower and savings are effected in material used.

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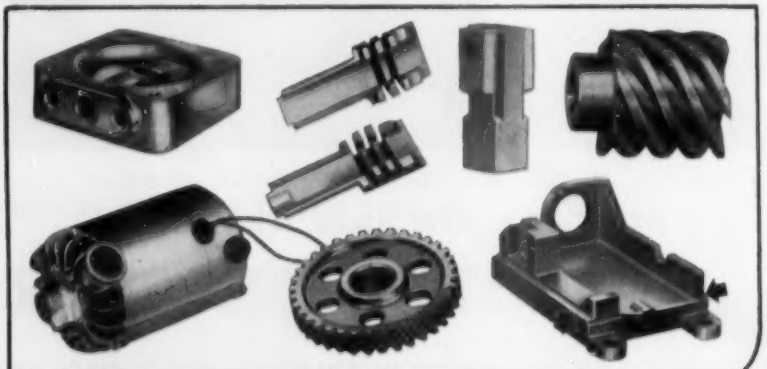
Whitehall plants a total of 75,000 square feet.

The new Muskegon plant will contain 85,000 square feet of office and manufacturing space and will eventually employ 1200 people. This operation will be headed by Donald Harpold as plant manager and Ajax Vartanian as plant superintendent. The industrial engineering for the new plant is being undertaken by Wayne Tice.

RUPERT DIE CASTING BOUGHT BY PIERCE

Acquisition of the Rupert Die Casting Co. of Kansas City, Kan., by the Pierce Governor Co., has been announced by Sidney L. Albert, Pierce president. Rupert, large producer of zinc and aluminum die castings, reports current sales at an annual rate of $6,000,000, with estimated net profit for the first fiscal quarter ending Jan. 37 of $250,000.

Carl V. Rice will remain as president of Rupert. According to Mr. Albert, Rupert's operations will be expanded, with construction of a new plant in Louisville, Ky., under active consideration.



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PATENTS
continued from page 30

AN APPARATUS FOR making permanent mold castings in which the melting pot and mold members are mounted as a unit. The crucible for melting the metal is electrically heated by "L" shaped elements. The crucible is mounted on trunnions so that it can be titled for pouring. A stripping means is provided in the mold.

(Patent No. 2,720,686 — Die Casting Apparatus — Garland R. Gordon — assigned to General Dynamics Corp. — issued October 18, 1955).

A DEVICE FOR DETERMINING the apparent density of a powder. The powder feeds from a hopper containing an agitator through a positioning cone and nozzle onto a multi-holed material. Means for application of pressure or vacuum are provided.

(Patent No. 2,720,109 — Frank Edwin Stirn and Arthur Sinclair Taylor — assigned to American Cyanamid Co. — issued October 11, 1955).

THE PREPARATION OF POWDERED iron using the carbonyl process which obviates the steps of communication and insulation. The iron particles are milled in the presence of a metallic silicate to induce the attachment of refractory particles to the surface of the powder particles. The treated powder is then reduced with hydrogen at a temperature of from 450 to 650C. Powder particles prepared in this manner are said to have improved electromagnetic and mechanical properties.

(Patent No. 2,720,453 — Process of Preparing Iron Powder of Improved Electromagnetic and Mechanical Properties — George O. Altmann — assigned to General Analine and Film Corp.— issued October 11, 1955).

INSULATED RISERS
continued from page 58

fluid casting/riser interface. This freedom from voids is particularly valuable in that three holes are drilled and tapped in this area. Formerly, many drills broke when they hit a void.

Voids in the area directly under the star-shaped cored hole will probably always be present. The geometry of the core is such as to create excessive turbulence in the bottom portion of the casting when the molten alloy passes over it, thus allowing air to be trapped in that section of the casting. Use of the insulating riser sleeve seems to allow this entrapped air to rise closer to the core (see Figure 3). Holes are drilled and tapped in this area also and the upward displacement of the voids means that fewer machining difficulties would be encountered.

Additional time must be allowed for riser solidification. Although all cores can be pulled without delay, any attempt to quickly remove the casting from the mold will allow the still-fluid riser to collapse onto the piece being cast. It was determined that solidification of the riser is a direct function of the insulating riser I. D. A delay of ½ minute was necessary when using a ½ inch I. D. sleeve and ¾ minute when using a ¾ inch I. D. sleeve.

Insulating riser sleeves are rather fragile and only six cast-

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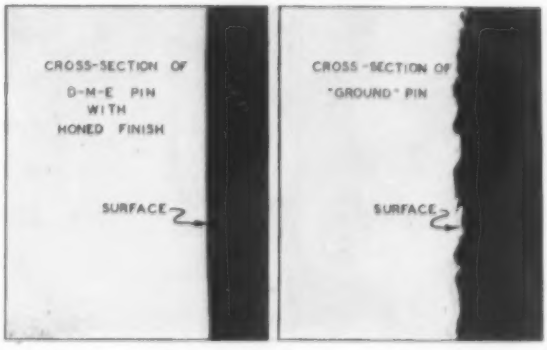
HONED FINISH

REDUCES WEAR and MOLD FLASH

D-M-E Ejector Pins are hot-forged, precision ground, nitrided and THEN HONED . . . to give you the finest finish possible. The photo-micrographs shown here illustrate clearly the result of this added D-M-E feature.

Under magnification of 500 X the so-called "ground" finish pins reveal a saw-like surface which gradually opens up the hole surrounding the ejector pins and eventually causes mold flash. D-M-E's "honed" Ejector Pins, under the same magnification, reveal a smooth finish which reduces wear and costly down time.



The above photo-micrographs were made in an impartial test by the Detroit Testing Laboratory, Inc. of Detroit, Michigan.

42 Standard Diameters from 1/16" to 3/4"

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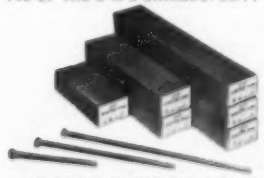

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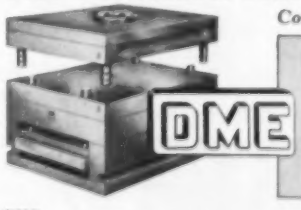

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2355

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ings were produced per sleeve. If the insert block had been a permanent part of the mold, with judicious handling the number of castings produced per sleeve could easily have been increased to 12 or 15. Although the sleeves will heat-check, they can easily be cut down below the point of checking and reused. Cycling the sleeves will also aid in increasing the number of pieces obtained per riser sleeve.

There is some difficulty involved in adapting insulating riser sleeves for use in permanent mold castings because of the nature of permolding. Some of these difficulties are:

1. Permanent mold operations are designed to produce castings at a moderately high rate of speed. The insulating riser sleeve is rather fragile and if proper care is taken in handling the sleeve, operations will undoubtedly be slowed down.
2. Riser sleeves are expensive and increase the cost of each casting.
3. The mold would have to be specifically designed so that the insulating riser sleeve would be easily accessible.

Because of these factors and because the results of using insulating riser sleeves were so promising, an insulated riser was prepared. As can be seen in Figure 4, the insulated riser consists of a refractory (A), flanged riser insert (B), an insert block (C) and a cover plate (not shown). When the riser insert is screwed into place a cavity is created between the riser insert and the insert block wall. A refractory placed in this cavity acts to decrease the rate of heat transfer from the molten metal in the riser to the body of the mold. The cover plate holds the refractory in the cavity. The insulated riser is much more suited to the permanent molding operation since it is of all-metal construction and can be used to produce an indefinite number of castings.

Figure 5 illustrates castings produced using the insulated riser. It will be noted that voids under the star-shaped cored hole are close enough to the cored hole to eliminate any possible problem in drilling and tapping the tapchanger. The illustration also indicates that not enough metal was available to completely fill the casting directly under the riser. The shrinkage porosity, however, is a problem of small proportions.

All cores were pulled in the normal manner and the increase in time required for solidification of the riser was insignificant. The insulated riser did not feed the casting as efficiently as the insulating riser sleeve. However, efficiency was greater than that of the normal riser.

As a result of this investigation, it would appear that insulating the metal in the riser from the mold effectively improves casting quality by decreasing porosity. The insulated riser, which makes use of an insulating layer built around a riser insert, offers more possibility for use than does the insulating riser sleeve. The insulated riser can be used over and over again and is more in line with the needs of the permanent mold caster.

When conventional methods of risering castings fail to produce sound castings, use of an insulated riser should be considered. Insulated risers can definitely be used to advantage in molds which are designed to make use of blind risers.

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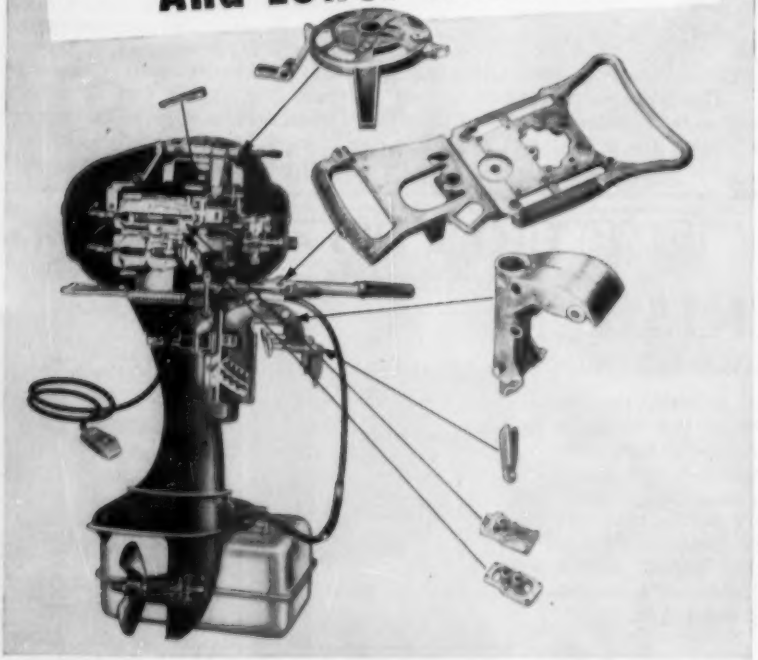

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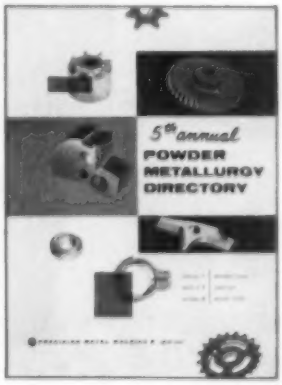

Here is the entire powder metallurgy industry, organized and presented for your use. If you're in the early stages of planning your first powder metal part applications, the Directory will guide your entrance into powder metallurgy. Even if you have used powder metal parts for years, you'll value the Directory for its complete, current listings to aid your purchasing. The fifth annual Powder Metallurgy Directory will be published in the April, 1956 issue of PRECISION METAL MOLDING.

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CLEVELAND 13, OHIO

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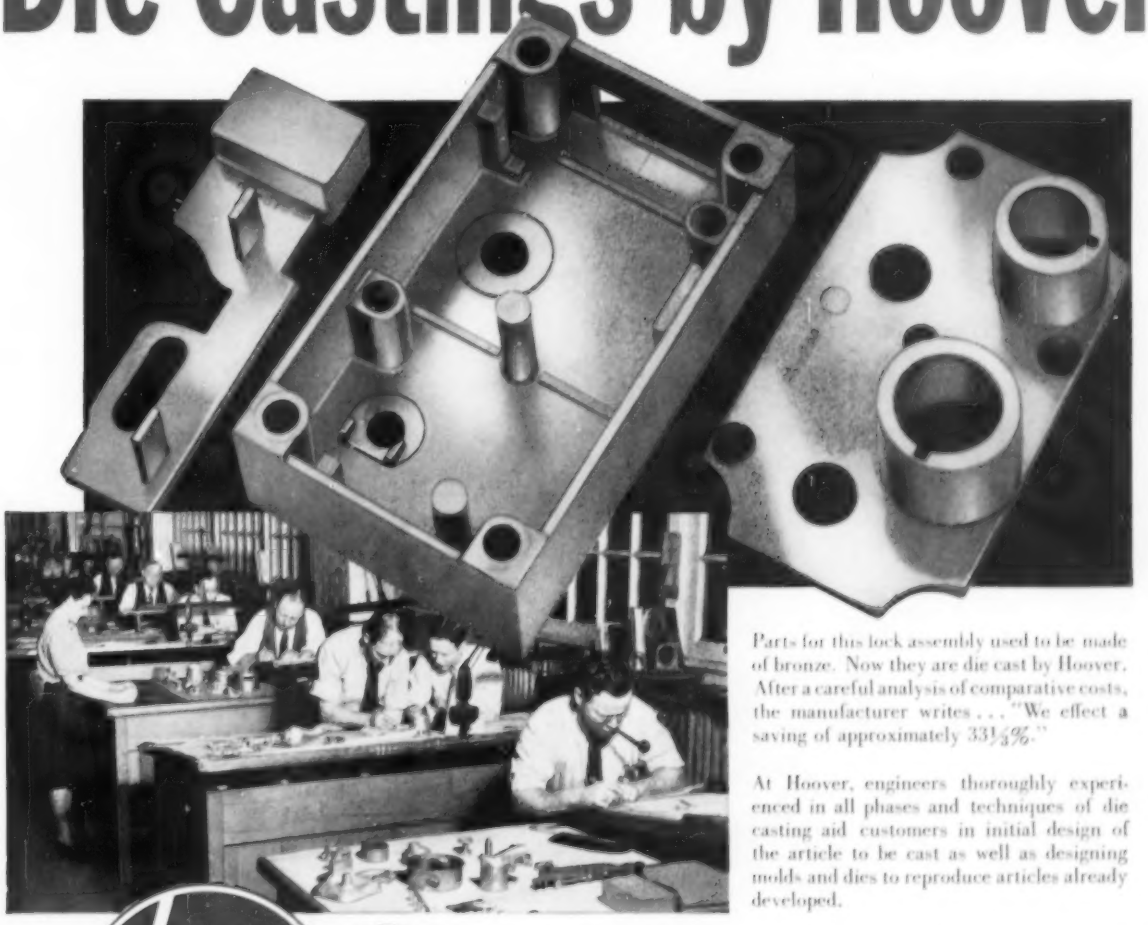

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